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EDITORIAL NOTES.

Emulating the Bushranger.

IT is with considerable indignation that those responsible for the conduct of the gas industry in the Mother Country—the birthplace of legislation controlling the industry—read the reports that have come to hand concerning the shameful proposals that are being made in Australia to grossly depreciate the value of gas companies' property there without any compensation, to break parliamentary faith with those who have invested money in the gas business there, and to undermine the public faith in legislative enactments governing investments and enterprise. There are several shareholders in Australian gas undertakings residing in this country; and never before have they or the shareholders in other gas or similar *quasi*-public concerns had their enterprise assailed by those who ought to protect them, and in the piratical manner that is now under consideration. The best friends of the Governments of New South Wales and Victoria may well bid them pause in prosecuting the rash schemes that they have before them, and consider the matters from the points of view of honesty and justice, and from that of the injury to the security that private enterprise and capital investment require to feel and to enjoy in order to encourage both for the well-being of the country. If this thing is done as proposed, the harm to the credit of the country will be out of all proportion to the gain that it is under contemplation to effect by a species of statecraft that savours more of mediæval times than this year of grace 1912. It is amazing that there should even have been any such conception as that before us, without the counterbalance of compensation. Where anything is forcibly taken from a person against his will without proper recompense, then there is no other term for it than robbery; and it is robbery at its very worst when those who despoil are those who have by statute given a guarantee of security to investors. We have never before met with anything of this kind in the whole legislative history of gas supply, nor in any country; and we hope we shall never do so again. If the Legislature of New South Wales persist with the Bill that is now before them, and if the Victorian Legislature accept the recommendations of the Board of Inquiry they appointed to investigate the affairs of the Melbourne Company, and propose legislation on the lines of the recommendations, then we hope the people of Australia will see in the actions of the two Governments a movement against private industry, enterprise, and confidence that ought immediately to be stayed by a powerful universal protest.

The story is too long to enter into in detail in our editorial columns. But information has been given in our last few issues as to what is being done, or is contemplated, both in New South Wales and in Melbourne; and a further considerable contribution to the story of the Melbourne inquiry, report, and recommendations is published to-day. The New South Wales Bill first called attention to the confiscatory plans relating to the Australian Gas Company and neighbouring concerns—the North Shore and Newcastle; and afterwards came the information as to the investigation and recommendations of the Board of Inquiry relating to the Melbourne Company. The New South Wales Bill proposes to apply new regulations to the first-named undertakings; but the regulations are of such a nature that, in the main part, they amount to despotic plunder. The Australian Company (as is also the Metropolitan Company of Melbourne) is one of those undertakings, alike to many in this country, with heavy premium-carrying capital—the premium bearing no dividend; and it has in its most flourishing years been paying 15 per cent. dividend on the nominal capital, which, of course, represents only a fair—indeed, moderate—dividend for a trading concern on the amount invested by the holder in the purchase of the stock. The Bill proposes to rob the holders of this stock by stages until the dividend reaches only 4 per cent., which would represent the miserable return of between 1 and 2 per cent. for those investors who have purchased at market prices on the faith of statutory protection. This is not all. It is intended that the standard price in the case of the Australian and North Shore Companies shall be 3s. 9d. per 1000 cubic feet, and that of the Newcastle Company 3s. 7½d. Taking the standard price of 3s. 9d. and a standard dividend of 4 per cent., the price would, under the sliding-scale, have to be reduced to 1s. 9d. per 1000 cubic feet before a 10 per cent. dividend was earned, and to 1d. before the present income of the proprietors could be again secured. If there are members of the New South Wales Legislature who call this honesty, then they need all the pity that can be spared by men of upright dealing. Really, if it were not known that this grave piece of injustice was seriously proposed, one might be pardoned for thinking that, in a civilized country, there was nothing more in it than a practical joke, or a piece of chicanery on the part of stock market operators. To consider it in association with the highest ideals of statesmanship is more than we can do. It is all hostile to Britishers' notions of justice; and if the South Wales Bill passes, or if the proposals are carried that reach us from Melbourne, this country and other countries will point the finger of scorn at those legislators who can demean themselves by becoming parties to such robbery of men, women, and orphans, whose capital, savings, and heritage have sought the safety of State-protected enterprise.

We turn to Melbourne. What is the true meaning of what is transpiring, or what threatens to transpire, there? Is it that Communism has seized hold of a section of the community, and that to wrest from the Metropolitan Company their property, and place it in the hands of the municipality at a low price, recommendations for legislation have been made that must have this effect? Much the same comments as have been applied to the New South Wales Bill apply to the recommendations of the Melbourne Board of Inquiry. The Company have had to contend with difficulties with which it has been very hard to effect any compromise; but by the policy prosecuted, more particularly in recent years, they are now—owing to the exercise of sound finance and the wise expenditure of money that might have been paid away as dividends (the needful expenditure being met without raising the price of gas)—at a point at which the consumers would, under the existing order of things, profit largely. But there intervenes this inquiry, which culminates in recommendations that all along the line indicate depreciation before expropriation, and depreciation, as at Sydney, without compensation. "Let us propose new "legislation," say in effect the Board of Inquiry, "to reduce— "without any counterbalancing advantage to those who "have, on the statutorily created basis, provided the capital "for the undertaking—the standard price of gas from 7s. to "4s., and at the same time make the standard dividend "10 per cent. On top of this, too, let us propose that the "basis of purchase by the Municipality be considerably "lowered and eased from that enacted in 1878." Australia, of course, is not England in the matter of capital and working costs. That is overlooked. But this surely has not been overlooked (and this makes the proposals the more repulsive), that in Australia, as in England, investors in private enterprise guaranteed by statutory enactments have a right to regard their investment as possessing the best of all possible root security.

Regulate, by correct means, private enterprise such as gas, electricity, and water supply; but do it fairly. When once done, and money is invested, it is not the part of any Legislature to stoop to the meanness of using their supreme power as a vehicle for plundering those who have had faith in what the legislators have already done. Elementary justice denies to any Legislature the right to practise any such duplicity. If the Legislatures of Victoria and New South Wales are of opinion that revision of gas legislation is required, then let the revision take the form that it has done in this country, including conversion of capital at the immediately preceding market price, on a 4 or 5 per cent. basis, with division among the present holders so as to

give them a dividend equal to that which has been received, with a sliding-scale on the lines adopted in this country, and with all future issues of capital conforming with the altered conditions. The Australian Companies are perfectly willing to submit to regulations such as are in force in this country, formulated so as to coincide with any differences in circumstances. Nothing more ought to be asked of them. But what has been proposed in Australia is repugnant both to honesty, and to statesmanship. We hope a large majority of the legislators of both New South Wales and Victoria will decline to be parties to an action that will deserve the reproach of all men.

Restriction as to Residuals Bargaining—A Warning.

In this week's issue, the examination is concluded of the Gas Acts passed in the present session of Parliament, which examination has been made to show the alterations that have been effected during the parliamentary course of the measures. The work of the session was recently reviewed in our leader columns; and there is no intention of again traversing the ground. But there is one of two important matters that make the session notorious for the gas industry, to which special attention should be again drawn, and that is the comprehensive manner (divulged by the review of the Acts) in which the chemical clause, or the restriction to free trading in the crude residual products of gas manufacture, was imposed in the Bills that came before Parliament. The other important matter was the calorific power standard; but it is with the former that we are now particularly concerned. It is going to be the subject of a full and unrestricted inquiry by a Joint Committee of both Houses of Parliament, when the gas industry will show that it is against the economic interests of the industry and of the public that anything should be done to give any of the dealers—and they free from all statutory regulation in their dealings—in these raw residual products paramount control over prices, by forcing all gas undertakings not in a position to work up the residuals in question to dispose of them to those dealers who, in this connection, are ordinary commercial traders. But, meantime, let us just look into the point as to the comprehensive scheme of the Alkali Manufacturers' Association (an Association about which but little is known outside its opulent membership) to use Parliament as an instrument for conferring upon them a trade privilege, the like of which, so far as we are aware, is without precedent in connection with commodities produced in more than one quarter, and the markets in which should be as free as those of any other commodities not commercially subject to parliamentary regulation. It is only because the business in gas supply is regulated by Parliament that the chemical manufacturers were given an opportunity to ask for a commercial privilege over the gas industry in the matter of residuals.

If we except the Standard Burner Act and the Benefits Funds Acts, some 24 Gas Acts have been reviewed in this and the previous three issues of the "Journal." Few of the measures escaped the imposition of the residuals restriction. The five Acts that did escape were (unless we have missed the point in going through the clauses), the Ashborne, the Bognor, the Shipley, the Swanage, and the Tendring Hundred. But no less than nineteen out of the twenty-four promoting gas undertakings had the restriction forced upon them. Large companies and small companies, municipal councils and district councils, were all similarly treated. The chemical manufacturers went to work with a will, elated and strengthened by success upon success, and realizing that every time Parliament inserted the restriction (whatever the form was) it created additional commercial strength for the chemical manufacturers, or buyers of the raw residual products, and correspondingly weakened the bargaining strength of the sellers of those residual products, as well as deprived gas undertakings of the power of being of assistance one to another in the event of geographical relation being favourable, or in the event of the chemical manufacturers depressing buying prices. Without mentioning Provisional Orders (the West Kent and Swansea Orders are typical) in which the restriction was inserted, the Acts illustrate well the objective of the chemical manufacturers. This objective is (unless Parliament is persuaded that it is not in the public interests that one set of traders should be invested with a commercial privilege to which such strong objection is taken) the complete crippling of the bargaining power of the gas industry in respect of the raw residuals.

Look at the list of gas undertakings (remembering that the Provisional Orders are not here included) showing the first successes towards that objective: Annfield Plain, Bawtry, Bedwellty, Belfast, Birmingham, Bordon, Brodsworth, Christchurch, Dunstable, Fleetwood, Herne Bay, Houghton-le-Spring, Leatherhead, Sidmouth, South Suburban, Wakefield, Wandsworth, Woking, and York. The variety of the concerns represented here is instructive; and it is the strongest possible evidence of the ultimate purpose of the chemical manufacturers. We hope, when the full inquiry is entered upon, those who appear to represent the interests of the gas industry will do so with the support of every constituent part behind them in asking Parliament not to place those with whom the industry has any trading relations in a favoured controlling position, thus creating fictitious market conditions. In a commercial matter of this kind, unless parliamentary control can be placed upon both parties, then an unjust position is at once created, and the gas industry feels and deeply resents this to-day; just as the chemical manufacturers would do if compelled to purchase only from one set of producers, or if their purchasing power was in any other way curtailed by statute.

Before leaving this matter, there is another point to which special attention is desired. Up to the present, there are not many promising signs that next session will be a heavy one for Gas Bills; but we have learned, from past experience, to mistrust portents in this connection, and to await the revelations of the "London Gazette" notices. Anyway, we would ask prospective promoters of Gas Bills to assure themselves that, in their Bills and Provisional Orders as deposited, the old form of the general purposes clause be inserted, and not to recognize the new "model" form until the Joint Committee of Parliament have reported on the question of the unconscionable restriction that the present session produced in relation to residual products. It will have been seen from the notice in last week's "Journal" of the changes in the "Model Clauses" that the authorities have altered the wording of the clause in a manner that rules out the old liberty, and imposes the restriction precisely in accordance with the desires of the chemical manufacturers. The old clause states that the company or the authority "may provide, produce, sell, dispose of, and deal "in gas coke, tar, and all other residual products resulting "from the manufacture of gas." This has been changed so that power is only given "to convert, manufacture, and "sell all residual products resulting from the manufac-"ture of gas *by them*." There is no reference here to "pro-"viding" and "dealing in," and the words "by them" effectually determines the scale of operations, and thus strengthens the commercial position of the chemical manufacturers as against the gas industry. The authorities have also appended a footnote quoting the text of the chemical clause; but this clause is unnecessary with the general purposes clause in the new form. With all respect for the parliamentary authorities, we do think the *status quo* in this matter might have been preserved in the "Model Clauses" until there had been a thorough investigation by the Joint Committee, and their judgment in reference to the question at issue had been pronounced. We will not say more than this; but we do hope that promoters of Gas Bills will exercise a care in not giving any tacit consent to the change by allowing the new clause to inadvertently appear in any Bill as lodged, through their Parliamentary Agents following the new model form. This is important.

Gas Supply and House and Health Betterment.

In building up its business, the gas industry has done a vast amount of work to improve social and health conditions. This is acknowledged by those who give any consideration to the subject. But few there be outside the gas industry who have been brought into adequate contact with the actualities of the case to get a full and proper view and impression of what the industry has done, and is doing, on present lines that means betterment for the community at large. The conditions in any one part of the social fabric cannot be improved without an indirect advantage being conferred upon all the other parts. For instance, the removal of insanitary, and the setting up of sanitary, conditions in any one quarter means the supersession of danger by safety, and that is an excellent thing for all. Through the prepayment gas-meter system, the gas industry has carried light and ready facilities for cooking into the homes of the working class; it has placed smokeless means of heating and cooking in the dwellings of all classes; it has taken smokeless fuel

and power into our industries. As a consequence, the atmosphere has been rendered purer; and the community at large has been benefited. But with all that has been done, there yet remains much to do. There is new work that the gas industry can take in hand to the advantage of the community, and in the doing of which its own interests will not suffer, but, on the contrary, will be enhanced.

The President (Mr. Corbet Woodall), at the meeting of the British Commercial Gas Association in Manchester, spoke of the obligations that parliamentary privileges impose upon gas undertakings. The administrators of gas undertakings, if they do not already do so, ought to realize that the interests of the community they serve are their interests, and that in the well-being of the community is centred their own well-being. Mr. Woodall is not satisfied that everything has yet been attempted in the right way to create appreciation of the advantages of gas to the poor; and he confesses that the small smoky chimneys which one sees on railway journeys through London and the provinces weigh on his conscience. That is the quarter—the quarter of the poor—in which he says good work and health-promoting work can be performed by gas undertakings. Members of the municipal authorities of Manchester and Salford who spoke at the meeting, and who come into more intimate contact than the President with, or have more intimate knowledge of, the malefic conditions under which the very poor struggle for existence, agree as to the potential work that the gas industry can do by making provision for the use of gas in the poorest homes.

Different people look upon this matter, we find, in different lights; and it is somewhat strange that, within a few days, there should be consideration of much the same question from more than one side. Most of our local municipal governors when drawn on to the topic of the improvement of the conditions of the poor, will at once begin to dilate on purer air, purer sanitary arrangements, and generally purer surroundings. These are all excellent considerations; and to them the gas industry by its smokeless fuel supply contributes. But there is an equally important aspect of the subject. The President fears that the very poor housewives—there must be myriads of them in this country—do not know how to make proper use of gas; and he grieves that elementary education has done so little to raise the standard of household economy, and let us add of health-giving conditions. Decent cooking, he also says, is absolutely impossible with the apparatus at present provided. Mr. Woodall, in making this remark, hits on the head one of the conditions that is as vital to the healthy conditions of the community as pure air and pure water. Dr. Toogood, Dr. Lyster, and others were lecturing last week at the Society of Medical Officers of Health; and they attributed much of the evil of tuberculosis among the poor not only to the character of the food they take, but to the bad character of the cooking of the food. Why is cooking so indifferently done in the massed habitations of the lower constituents of the communities of our large cities and towns? We are afraid that the want of facilities for readily doing the work is the chief reason for the trouble. In the homes of the poorest of the poor, the old crude and cumbersome mode of obtaining heat for cooking in decrepit, ill-set, smoky kitchen stoves is still the system that very largely obtains; while if there were planted in these homes the facility of a small ever-ready gas-oven, with fuel purchasable in pennyworths, the fact would indubitably soon produce, with very little instruction indeed, the condition of good cooking that would, according to Dr. Toogood and Dr. Lyster, much improve the health returns of our cities and towns.

We hear the contented remark that "these people can "have prepayment meters, fittings, and cookers on the "usual terms. However true that is, the fact remains that the poorest of the poor are the slowest to move in trying to effect an improvement in their conditions. Whether it is the oppression of poverty and the inertia bred by their dolesome surroundings that stay them in trying to raise themselves from their present conditions by means that lie close at hand, we do not know. But the fact of neglected opportunity is there. We must not blame them, and pass by on the other side. If they will not come to the gas industry, the gas industry should go to them. "Seek out," said Mr. Woodall, "the *actual needs* of *all* classes of consumer, and "satisfy them." The prepayment system has been far too rigidly standardized. By some arbitrary process, the number of lights and the size of the cooker (if a cooker is included) has been determined for all classes of prepayment consumer in every district; and we know of cases where over this prepayment business the "take-it-or-leave-it" policy still reigns supreme. Just as the social structure is divided into sections, so are the sections subdivided, and the requirements of the subdivisions differ. The needs of the ordinary consumers vary considerably, and this is fully recognized by the gas suppliers. The requirements of the lower social stratum also vary greatly. Meet them; and in meeting them good will accrue to the poor, to the community generally, and to the gas industry. The President suggests that "an experiment might be helpfully tried upon "a chosen district of distinctly poor dwellings, with the "object of ascertaining what kind of help could be bene-"ficially extended to enable the people to live more comfort-"ably." Does this foreshadow an experiment? If so, it will be watched with keen interest. It is an experiment that can be carried out by any undertaking without absolute loss. All that has been done by the gas industry in the way of ameliorating the conditions of the community, so far as the industry has gone at present, has, on balance, shown to its advantage, while producing public benefit.

Improving the Working of Small Sulphate Plants.

THERE was one part of the Presidential Address that Mr. F. Shewring delivered, at the meeting of the Midland Junior Association last Saturday week (*ante*, p. 227), that particularly attracts attention. That is the section of the deliverance where he describes how he has improved the working results of his sulphate of ammonia plant. Time and again comment is made by critics upon the obvious loss of ammonia that is going on, owing to the inefficient operation of sulphate of ammonia plants in not a few gas-works. But the criticism does not appear to have much effect; for, half year after half year, some of the accounts that reach us do not indicate any very great attempt at improvement. Mr. Shewring finds that the production variations are really inexplicable—not on the side of works showing, and actually receiving money for, good makes of sulphate of ammonia per ton of coal carbonized, but on the side of those whose makes exhibit, though circumstances are very similar, a great deficiency from the high returns of their neighbours. Here is one gas-works making close upon 28 lbs. of sulphate of ammonia per ton of coal; while another not far distant, using coal from the same field, is getting rather more than 8 lbs. less per ton. There is no justification for such a difference; yet it is an actual case. The difference represents considerable financial loss on the quantity of coal carbonized—a loss which if capitalized would make the administration concerned rub their eyes vigorously.

Naturally, small works such as those at Droitwich cannot expect to get in practice so near to the theoretical production as the larger works, owing to the want of capacity, and the question of permanent attention. Some of the largest works occasionally lapse from the high efficiency which they normally realize from their sulphate of ammonia plant; but the cause is generally discoverable and remediable. This being so, in small gas-works it must not be expected, with their deficiencies due to condition, that the highest standards can be reached and always maintained. But there is no reason why the manager of the small works should not ascertain whether there are no loopholes of loss in his sulphate of ammonia working that can be readily eliminated. Mr. Shewring did this; and, as the address shows, he made an improvement that gained him another 2 lbs. of sulphate of ammonia per ton of coal carbonized, and produced greater constancy in working, and will continue to do so, as long as the present plant is in operation. In small works an additional 2 lbs. of sulphate per ton on the aggregate of the coal carbonized may mean a permanent income of several pounds, and be well worth a moderate expenditure to obtain. Take Droitwich. If the quantity of coal at present carbonized is about 2000 tons (we think it is rather more than that), the 2 lbs. per ton will not be far away from a total additional production of 2 tons, which, at the current market price, is a good return on the expenditure of the small sum incurred in effecting an alteration, by the exercise of ingenuity, as in this case.

What Mr. Shewring found from the investigation that his dissatisfaction with the sulphate returns caused him to make was that, with the labour that he could afford to put on to the plant, the hand pump arrangement employed for injecting the milk of lime into the still resulted in irregular working. The displacement periodically of the liquor containing the

fixed ammonia and reduced still-temperature were the detrimental results of spasmodic pumping; and under such circumstances maintenance of any standard of working could not be expected. This defective system of feed has been superseded by a simple form of injector (described and illustrated in the address) which can be operated intermittently or arranged to give a fairly constant feed of milk of lime to the still. The device is quite a simple one; and it is obvious that it is inexpensive, easily applied, and adaptable at other works where the circumstances are similar to those at Droitwich. Another simple working improvement that contributed to greater efficiency was made by increasing the seal of the trays of the still and securing extra agitation of the liquor. The prompting cause of this improvement was due to the free ammonia in the bottom tray being found in excess of what was considered legitimate; and this, it was determined, was due to a fault in time-contact. Hence the application, and the successful application, of an increased seal to remedy the defect. There is economy and profit in small improvements such as Mr. Shewring describes.

Manchester Street Lighting Experiment.

The article that appeared in last week's "JOURNAL" on the above subject has created some interest in the city; and we see that Mr. Councillor Kay, the Chairman of the Corporation Gas Committee, approves of the points made in it. But—this is not to be wondered at—Mr. Alderman Walker, who is a member of the Electricity Committee, does not approve of the article. He thinks that, as the reports of Mr. Jacques Abady and Mr. Haydn Harrison will shortly be presented at a meeting of the City Council, it would have been better not to prejudice the matter by making *ex parte* statements at this juncture. He also goes on to say that, at an early date, the public will have an opportunity of contrasting the considered opinions of the two experts with the remarks made by the "JOURNAL," and will be able to form their own opinions of the criticisms offered. Mr. Walker does not himself challenge our points, but merely contents himself with referring to "*ex parte* statements" and to the "considered opinions" of the experts. Permit us to say that our article was based upon our own observations, and not without knowledge of what constitutes good street lighting, and that what we said was "considered" before it was written. After consideration during a further week, we are as much impressed as ever over the disparity of the comparative installations, and over the abuse, in the electricity installation, of all the elements of perfect, scientific, rational lighting in order to get volume of light, without regard to quality, proper distribution, and a light that is not a public disadvantage on account of its inconstancy and glare. We shall be interested in seeing copies of the experts' reports, to ascertain whether they have made proper recognition of the various points incorporated in our article last week, and not based their reports merely on illuminating power tests derived from a state of inequality, and on a condition in which one of the competitors renounces all the scientific attributes of illumination, in order to throw down on to the illumination photometer the maximum candle-feet. The struggle to obtain this single end (even at the sacrifice of illumination principles) is so grotesquely apparent that it cannot escape the eye of any illuminating expert—whether or not engaged by the Corporation. If the illumination photometers were used in the tests so as to take count of light and shadows, there will be some wide discrepancies in the figures applying to Portland Street, or, at any rate, there would have been if the tests were made on the night of partial fog when the inspection of the lamps was made by us.

Bad Flame Arc Distributors.

The mention by Mr. Alderman Walker of Mr. Haydn Harrison reminds us that he was writing on this very subject in the "Electrical Times" in the spring of this year [see "JOURNAL," April 30, p. 274]. He then pointed out that no greater mistake was ever made than to imagine that because a lamp gives a powerful light at 40° to 60° from the horizontal, it can be used at long distances apart for street lighting. Mr. Harrison was alluding to flame arc lamps. Quite apart from the dazzling, flickering, restless traits of this type of lamp, especially when those faults are not subdued by the use of opaque globes, the density between the flame arc lamps placed at long distances apart (which density is accentuated by the patches of bright light near the lamps) are not agreeable to even an electrical expert who has to make out a good case for his clients. If flame arc lamps are brought closer together, the results are increased cost and (these are Mr. Harrison's own words) "a degree of illumination much in excess of that generally required for street lighting." We are not putting these considerations to prejudice the question as Alderman Walker hints. But the points that impressed us on making independent inspection are matters, as are the additional ones made here, which in our "considered opinion," should be in possession of the Council and the public, if they are not dealt with in the reports of the experts. What Manchester wants is the best quality light; and the light that will give its best efficiency under the worst of atmospheric conditions. Figures alone may be made to prove anything. The illumination tests of one night may not be representative of what would be obtained when the elements are at their worst. Then it is that quality of light has an illuminating efficiency that is worth a good price.

The Power of Directors.

The question of whether a director of a company, who was desirous of obtaining certain information independently of the board, as to the expenses of one of the company's departments, had any right to such information, except with the consent of the board, recently formed the subject of a letter in "The Times;" the chairman of the company having ruled that the director had no such right. The director in question (who was the writer of the letter) said that his request was to have personal access to the books of the company for inspection, and to such documents as should assist him in making an examination into the particular subject of his inquiry. Regarding the matter of importance, he declined to be satisfied with the chairman's ruling, and submitted the two following questions to an eminent counsel whose speciality is company law: (1) Has a director of a company independent right of access to the books of the company for the purpose of gaining information? (2) Has a director of a company an independent right of access to the correspondence of the company for the purpose of supplying himself with information? To his surprise, counsel answered both questions in the negative. His opinion was that a single director, being one of the board of directors, has no individual right of access to the books and papers of the company for the purpose of obtaining information other than information which the public or any shareholder is entitled to obtain. In support of this view, he cited a judgment, in which it was laid down that whatever authority is given by shareholders to directors is given them as a body, and not to each of them individually. A correspondent of the "Financial News," dealing with the matter, remarks that where a director desires to inquire into the expenses of one of the company's departments, his duty is surely to inform his co-directors of his reasons for this proceeding, and to submit to their judgment as to the necessity or otherwise of the suggested inquiry. That the views expressed by counsel are the best for all concerned, he is strongly of opinion. His reason is that "either supreme authority in a company's affairs (apart, of course, from the shareholders themselves) is vested in the board as an aggregate or it is vested in the individual directors. If it is vested in the aggregate, then one of the factors of that aggregate must yield obedience to the corporate decision. If it is vested in the individual directors, and they consequently have authority, in their individual capacity, to take whatever steps they may choose in the supposed interests of the company, it is impossible to forecast the complication and litigation which would certainly follow."

Distribution and Use.

The Eastern division of the Scottish Junior Association met on Saturday; and the chief items in the programme were the Presidential Address of Mr. A. Bishop, and a lecture by Mr. H. O'Connor. The President devoted himself to several matters associated with gas distribution and business. In connection with the former, he marshalled the points which show how largely distribution practice has been transformed by the requirements of business expansion and modern gas use. He touched, too, upon some of the points of the distribution system that, under current circumstances, are the most likely seats of leakage, and urged the exercise of very complete practices in maintaining the integrity of the canalization. We know that modern external traffic conditions have imposed more stringent obligations on the suppliers of gas and other owners of property reposing in the subsoil of our roads;

and these same traffic conditions have imposed on road authorities the obligations of constructing stronger roads. This is a matter of which sight must not be lost. In London and other places where roads are now built with concrete foundations and are paved, the cost of main work has much increased; and the trend of things elsewhere is such that the cost of the work is on the upgrade. Every opportunity must therefore be taken to overhaul mains with the view of saving subsequent expense. The Road Board's advisers are advocating new constructions of road crusts with bituminous binding; and these crusts will cause the opening of roads and the after-repair to be more expensive than the more negotiable form of crusts that the owners of underground mains have to deal with now, or had to deal with before the coming of the stronger crusts. Therefore, the obligation will be the greater on pipe owners to do their part when roads are disturbed for improvement work by the road authorities in taking the opportunity for examining, and repairing or enlarging, as the case may be, their own property. Added to the inducement for doing this of the stronger road crust are the higher gas pressures of the times. The lecture by Mr. O'Connor contains many matters that all juniors—and not only juniors—should know about the bunsen burner, particularly the points that have value in obtaining from atmospheric burners the highest efficiency according to the purpose and conditions of use. The experience gained since the bunsen burner came so extensively into the spheres of domestic and industrial service has taught us more of it and its requirements for different purposes than was ever previously known; and development of knowledge has told us how largely the bunsen burner by simple auxiliary means can be made to intensify its efficiencies in various operations. Lectures such as that of Mr. O'Connor assist to broaden that knowledge, as well as to refresh the memories of those who have made a study of the burner and the means of obtaining from it the best profit.

Amenities at Brighton.

There is a nice little point which the Brighton Recorder may now have to consider, as the result of a matter which came before him some days ago at the Borough Quarter Sessions. Strictly speaking, there are two points; and it is only in the event of his deciding the first one (as to whether he has jurisdiction) in the affirmative, that he will need to determine the second. Pending the delivery of the Recorder's reserved judgment, opinions on the case may remain unexpressed; but brief attention may be drawn to the facts, which will be found set out at length in another part of this issue. In Brighton, as in other towns all over the country, large numbers of outside incandescent gas-lamps have been fixed in connection with business premises; and as they are efficiently maintained by the Gas Company, there is necessarily a great gain by their use to the brightness of the thoroughfares concerned. So far, so good. In many instances, however, the shopkeepers have had words put on the globes of projecting lamps; and this the Corporation maintain brings them within the definition of the word "sign." Under an Act passed about eighty years ago, the Corporation have power to order the removal of (and failing this being done, to remove themselves) any projecting signs, &c., which in their judgment are a public annoyance or nuisance by reason of their projecting into, or encroaching upon, or otherwise annoying or endangering, the public passage along any of the streets, &c. Acting under these powers, the Surveyor reported on all projecting signs in two streets; and in each of these the appellants at Quarter Sessions happened to have shops, outside which were projecting lamps having on their globes the word "Clark." The Corporation intimated that the lamps might remain if the advertising word was taken off; but the appellants declined to remove either the word or the lamps—so the Corporation bodily took away these "signs." The height from the ground-level at which the lamps were fixed was such as precluded them from becoming a "danger," even with present-day head-gear; but the Corporation relied upon the fact that the amenity of the thoroughfares was interfered with by there being lettering upon a projecting lamp, and that they were entitled to regard this as constituting an "annoyance or nuisance" within the meaning of their Act. Evidence was not called to show that anyone had found the lamps to be an annoyance or a nuisance; the argument being, as already remarked, that the Corporation have jurisdiction to remove what, in the shape of projections, they themselves consider to offend in either of these respects. It is evident from the local Press that Brighton traders feel aggrieved at the Corporation objecting, as they are doing, to so common a form of advertising as an outside gas-lamp; but there is a point about the evidence which should prove reassuring to some of them at any rate. It was stated by Counsel during the hearing that "one of these lamps, with a name upon it, belongs to the Chairman of the very Committee who signed the notice" [to remove certain lamps], "and that lamp is now up." This may probably be taken to show that the Corporation are not bent upon a policy of extermination so far as projecting gas-lamps with wording on them are concerned.

PERSONAL.

Mr. JOSEPH E. BISHOP, of the Power Gas Corporation, Limited, of Stockton-on-Tees, previously Works Manager to the Dowson Economic Gas and Power Company, has received an appointment on the engineering staff of Bonecourt Surface Combustion, Limited, of London.

Mr. WILLIAM SANDOM, of Broadstairs, has been appointed Collector and Clerk to the Sleaford Gas Company, under Mr. H. Wimhurst, the Engineer and Manager. Previously he was with Mr. F. Higginson, the Engineer, Manager, and Secretary of the Broadstairs Gas Company, under whom he served nine years.

Mr. HARRY HURST, B.Sc., of Newport (Mon.), who has been appointed Public Analyst and Bacteriologist to the Corporation of Bolton, will, as part of his duties, have to carry out analyses required by the Gas Committee. Mr. Hurst is Deputy Agricultural Analyst for Monmouthshire and the Borough of Newport, and he was trained as a chemist at the Sheffield University.

OBITUARY.

The death occurred last Tuesday of Mr. DAVID F. SCHLOSS, to whose statistical work in connection with industrial affairs reference has on several occasions been made in the "JOURNAL." He was the first Director of the Census of Production, but had to relinquish the position on account of ill-health. He produced the first report on profit-sharing; and at the time of his death he was engaged upon editing the second.

The death occurred recently of Mr. JOHN ELIOT HODGKIN, the Managing-Director of the Pulsometer Engineering Company, Limited, of Reading. He came to London in 1875, and, in conjunction with Mr. Mathias Neuhaus, purchased the patents of the pulsometer steam-pump. A few years later, the business was converted into a limited company, under the title of the Pulsometer Engineering Company; the works being at Nine Elms, until the year 1900, when the present works were put down at Reading. Deceased was in his eighty-third year.

The death occurred on the 13th inst., at his residence at Sutton (Surrey), of Mr. FREEMAN BURROWS, who was known to some of our readers in connection with the Torbay Paint Company, in which he had been a partner for nearly forty years. Deceased, who belonged to an old Yorkshire family, and was nephew of the late Sir Thomas Freeman Firth, Bart., and Sir Charles Firth, was in his 64th year. He was an hereditary freeman of the City of London; his Guild being the Clothworkers' Company, in which he had obtained a high position. Owing to his extremely genial nature and gracious personality, he was held in high regard both by the residents at Sutton and in business circles. The funeral took place in Abney Park Cemetery, last Thursday.

London and Southern District Junior Gas Association.

The Association will hold the opening meeting of the session at the Westminster Technical Institute, Vincent Square, S.W., next Friday. There will be an address by Mr. W. Doig Gibb (Chief Engineer of the South Metropolitan Gas Company); and this will be followed by an address by the President (Mr. J. D. Winslow, of the Lea Bridge Gas-Works). Light refreshments will be served at the conclusion of the proceedings. The succeeding fixtures in a very full programme are as follows: Nov. 9—Visit to the East Greenwich Gas-Works. Nov. 22—Paper by Mr. A. R. Griggs, on the "Measurement of the Flow of Gases in Mains by Means of the Pitot Tube." Dec. 7—Visit to the Meter-Works of Messrs. Thomas Glover and Co. Dec. 13—Paper by Mr. W. H. Vanner, entitled "Notes on the Enlargement of a Gasholder." Jan. 11, 1913—Visit to the Bromley-by-Bow Gas-Works. Jan. 24—Paper by Mr. H. de B. Birkett, B.Sc., on the "Humphrey Internal Combustion Pump," illustrated by lantern slides and models. Feb. 6—Visit to Messrs. Falk, Stadelmann, and Co.'s Earlsfield mantle factory. Feb. 21—Address by Mr. Jacques Abady, on the "Principles of Gas-Testing Apparatus." March 1—Annual Dinner. March 15—Visit to the Poplar Gas-Works. March 28—Address by Mr. Thomas Goulden (Chief Engineer of the Gaslight and Coke Company). April 12—Visit to the Lea Bridge Gas-Works and Electricity Works. April 25—Paper by Mr. E. G. Stewart, on the "Technics of the Ascension-Pipe." May 23—Annual General Business Meeting. June 7—Visit to Hastings, and inspection of the Gas Company's works, distributing station, and show-rooms. A special course of lectures in the higher technics of gas engineering and supply are being arranged at the Westminster Technical Institute; and details of these will be announced in due course.

GAS ACTS FOR 1912.

[Fourth Article.]

The final Acts referring to gas supply that we have to examine, with the view of ascertaining variations from the Bills as originally lodged, are the promotions of local authorities. The Bills were reviewed in our issue for Jan. 30 last (p. 272).

In the session of 1911, the Ashborne and District Gas Company were incorporated, and obtained statutory powers. A purchase clause was then inserted in the Company's Act; and, in pursuance thereof, the District Council promoted a Bill this session to give effect to the purchase. Acquisition of the undertaking is to be by agreement or arbitration. If by the latter process, the Arbitrator or Umpire is not, in assessing the amount to be paid to the Company, to have regard to the fact that they obtained an Act in 1911. But there are to be paid the taxed costs of obtaining the Act, the expenses incident to transfer and obtaining amendments in the Bill for this Act, and the amount expended by the Company in supplying with gas the premises of the Nestlé and Anglo-Swiss Condensed Milk Company, the premises of the Children's Home, and new property. The other conditions relating to the transfer and winding-up are of normal character. No other changes from the Bill are encountered until we come to the price of gas. The proposal that the price be 3s. 4d. within the urban district remains; but the intention that the charge beyond the urban district should be 3s. 10d. has been altered to a stipulation that it is not to exceed by more than 6d. the price for the time being charged in the urban district. We do not see the 25 per cent. discount clause that was in the Bill; but the stand-by clause relating to private gas plants remains. The Council are granted permission to borrow the sum necessary for the purchase of the concern; but the open power required to borrow any further sums under the sanction of the Local Government Board has been limited to £5000. The period for repayment from the date of borrowing has been reduced from 40 to 35 years. [*Parliamentary Agents: Messrs. Dyson and Co.*]

A substantial Act is that of the Bedwellty District Council, and it is an important one for the area under the Council's jurisdiction. The part in which we are concerned is that relating to the transfer of the New Tredegar Gas and Water Company and the purchase of the Blackwood Gas Company, and the sale by agreement of so much of the latter concern as is within Mynyddislwyn to the Council of that district, providing sanction is obtained from Parliament in either of the next two available sessions. The Mynyddislwyn Council are to pay to the Bedwellty Council £2705 for the portion of the undertaking in their area, and a sum equal to the actual expenditure by the Council on the provision of any new gas mains, pipes, and other works within the district in question. Provision is also made for the supply of gas in bulk to the Mynyddislwyn Council (until they provide their own works) at 3s. per 1000 cubic feet. The terms for the transfer of the New Tredegar undertakings were stated on June 30 last. Briefly, the consideration is £23,415 in cash, and all stores beyond the value of £200 are to be paid for. Since then an agreement has been effected with the Blackwood Company, the consideration being £23,300, *plus* such sum as may be due by the Company either to their bankers or any other creditor on capital account on the day of transfer, with the value of stock and stores as provided. An additional sum of £500 is to be paid by way of compensation to the Directors and Secretary. Power is given to the Gelligaer District Council to purchase the mains, pipes, and apparatus in their area, providing the sanction of Parliament is obtained through a Bill promoted in either of the next two available sessions. Provision is made for the valuation of the property. In the "maintenance of gas-works" clause, the chemical restriction has been inserted. The maximum price of gas has been reduced from 6s. to 5s. for gas supplied within so much of the urban district of Gelligaer as is comprised within the gas limits of the Bedwellty Council, or for gas supplied within a radius of 1¼ miles from the gas-works, and 5s. 6d. for gas supplied elsewhere within the gas limits. The price for gas for public lighting is not to exceed 4s. per 1000 cubic feet within the part of Gelligaer included within the gas limits, 4s. 6d. within a radius of 1¼ miles from the gas-works, and 5s. per 1000 cubic feet elsewhere within the gas limits. Power to borrow the necessary purchase money is granted, and such other sums as may be required for extensions, improvements, and working capital as the Local Government Board may sanction. Money borrowed for the purchase of the gas-works is to be repaid in 35 years; and for other moneys the Local Government Board will fix a period not exceeding sixty years. The water part of the measure will be dealt with later. [*Parliamentary Agents: Messrs. Baker and Co.*]

The Belfast Gas-Works Extension Act next calls for notice. It will be remembered that, including the purchase of lands and the construction of works, the estimated expenditure on the new scheme is £400,000. No changes have been made (since noticing the Bill on Jan. 30) in the clauses of the measure to which it is necessary to allude, other than that the Council have had the residuals restriction placed upon them. Stand-by clauses referring to both gas and electricity appear. Borrowing authorization up to £400,000 is allowed; and the periods of repayment proposed—60 years for money spent on lands, and 40 years for money spent on gas-works—have been granted. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Act of the Birmingham Corporation contains the land purchase powers for new gas-works described when referring to the Bill on Jan. 30. The only addition to the gas section of the Act is the "chemical clause." [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

There is a big hiatus now in the notices in comparison with the review of the local authority Bills on Jan. 30—due, first, to the dropping of the Cannock Purchase Bill; secondly, to the Salford Corporation proceeding by Provisional Order instead of by Bill as originally intended; and, thirdly, owing to the agreement between Salford and the outer districts regarding the appropriation of the profits of the Salford gas undertaking, to the abandonment of the Bill promoted by the Eccles Corporation and the District Councils of Swinton, Pendlebury, and Worsley.

This brings us to the Shipley District Council Act, which contains only a small part referring to gas. In the clauses there is not a single change from the reference to them on Jan. 30, save that, from the prepayment meter clause, the words have been deleted which stipulated that the provisions of the Act, and of the Acts of 1870 and 1901 applicable to ordinary meters, shall, so far as applicable, apply to prepayment meters. [*Parliamentary Agents: Messrs. Lees and Co.*]

The Sidmouth District Council Act consummates the provision obtained when the Sidmouth Gas and Electricity Company were in Parliament in 1911 relating to the purchase of the undertaking, and gives the Council the power to become the owners of the property and the gas and electricity suppliers in the locality. Power is conferred upon any authority outside the jurisdiction limits of the Sidmouth authority to purchase the part of the undertaking within their area on obtaining the necessary authorization from Parliament or the Local Government Board. The purchase of the concern by the District Council is to be by agreement or arbitration; and provision is made for the compensation of Mr. Thomas Douglas, the Managing Director of the Company. The insertion of the words "by them" in the "maintenance of gas-works" clause has placed upon the Council the residuals limitation sought by the Alkali Manufacturers' Association. There are no other changes in the clauses (which include a stand-by one relating to both private gas and electricity plants) save in that alluding to the borrowing powers. The Council are given the power to borrow the necessary money for purchasing the undertaking, with a repayment period of 35 years, instead of the requested 40 years. Working capital to the amount of £2000 is granted, with a period of ten years for repayment. Additional borrowing power is allowed by consent of the Local Government Board, with a repayment period (as determined by the Board) not exceeding 60 years. The accounts of the gas and electricity undertakings are to be kept separate. [*Parliamentary Agents: Messrs. Baker and Co.*]

ELECTRICITY SUPPLY MEMORANDA.

Brutum Fulmen—The "Exact Opposite" to the Lewes Eulogium—"Broad-Minded Views"—Courting Favour from the Top Dog—More "Minor" Breakdowns—Fireproof Generating Stations—Safety and Fatalities—Electric Cooking Apparatus—Radiator Phenomena.

Just before going to press yesterday (Oct. 21), we received a copy of our fortnightly contemporary "Gas" dated Oct. 16; and we see from it that a little friendly and jocular "dig" on the subject of a prize has been taken with very bad grace—measured by columns, to the length of nearly two. So angry, in fact, is the writer of the article before us that he quotes the whole of the sub-headings of the "Electric Supply Memoranda" for the week in question as though they referred to the paragraph under violent attack. The irascibility shown is altogether out of proportion to an offence never intended, but which has been magnified into one. We will not be so foolish as to imitate our friend in this matter. This, however, must be said, that we regret having written "monthly" instead of "fortnightly" in mentioning, good naturedly enough, the youngest of our contemporaries. Our friend may also be interested in knowing that the writer of "Electric Supply Memoranda" was working with a photometer long before the pentane standard was thought of, which places experience in this connection a good distance back, and he also worked at other things connected with gas prior to that. But we do not boast of these things through a megaphone from the house tops nor in the market places. The record of our work for the gas industry is widely known; and we can leave it at that, finding much useful work still lying at hand. By the way, in the editorial of our contemporary, we read: "You do not often find one member of a cricket club who plays cricket talking about himself as the only player. He has a good word for the others, and forgets himself."

Our electrical friends have been looking with very envious eyes upon the proceedings of the British Commercial Gas Association a fortnight since, as fully reported in the "Journal" last week. But, on the whole, the references to the subject are congratulatory rather than otherwise, and are held up as an example to the electrical industry for putting their own house in order, and for aiming at higher things. Nothing perhaps has surprised the electrical industry more, among all the vitality the gas industry has shown, than the manner in which this effective organization for educational and publicity work was conceived, brought into

existence, and commenced an active and enthusiastic career—partly, but only partly, as an answer to the Electricity Publicity Committee; but without emulating them in employing misrepresentation and vituperation as factors in business getting, though always prepared to deal promptly with any slander or misstatement on the part of electrical people when such is brought to their notice. We acknowledge the fair comment on the proceedings and work of the Association, and of the discernment on the part of some of our electrical friends (whose perception when dealing with gas affairs is not always of the keenest, nor their knowledge of those affairs of the highest) of the dignified policy of the Association. There is one matter, however, we should much like the "Electrical Review" to deal with—positively and chemically. It says, speaking of the proceedings, that "Professor Vivian Lewes delivered his customary eulogium of gas as the exact opposite of what it is universally believed to be." Very well. Now here is an opportunity for the "Review" to expose its wonderful scientific knowledge, and to crush, once and for all, this particular Professor, whom it regards as a hardened perverter of the truth. We invite the "Review," through the two-power intelligence of its Editors, to deal seriatim with the points of Professor Lewes's lecture, which was published *in extenso* in our last week's issue. Mere negation is not what we ask for from the "Review," though it is somewhat frequently found in its columns when dealing with gas matters. We shall not in the least mind the tone adopted in dealing with the subject (even a little pomposity may be thrown into it), so long as the points of the lecture are treated scientifically. Professor Lewes is not at all particular as to the methods adopted by those who desire a little controversy with him; he is also fond of a joke, and has a very hearty laugh, which is a bit irritating when one is conscious that he has cornered one. We may ask the "Review," in all friendliness, not to make Professor Lewes laugh through an exposure of any ignorance on chemical and physical matters. Let us also assure our contemporary that we shall look with interest for its serious and scientifically stated argument that is to show the "exact opposite" of the "customary eulogium."

Among the fair comment on the work of the Association, we acknowledge the words of the "Electrician." It states that in the Association's literature there is very little exaggeration of fact. It will not go so far as to use a definite negative. That, though true, could hardly be expected. It also asserts that the "campaign of the Association has shown how ignorant the public still is on many important matters relating to the uses of gas." That is true; and the statement would have been more complete if, after the word "public," the parenthetical remark had appeared "including numerous electrical engineers." Perhaps, *if* the "Electrical Review" accepts our invitation to deal scientifically with Professor Lewes, we shall be in a position to extend the parenthetical remark. However, that is a point for decision later on. Meantime, we see that discussion still proceeds as to the better organization of the electricity industry by the amalgamation of the several different bodies whose activities are directed more or less to sectional interests than to the larger industrial ones. Among the correspondents who have publicly expressed sympathy with the idea is Mr. Alex. C. Cramb, of Croydon, who was in discussion with us recently over certain discrepancies in published figures, and who dropped out of the discussion with splendid agility (which we thought more than a bit unbecoming on the part of the Vice-Chairman of the Electricity Publicity Committee) when challenged to a photometrical, time, and cost trial, on the conditions that the results were attested by Mr. Cramb, and that we were allowed to publish them in our own and the electrical papers and broadcast in Croydon. We remember the lines of that controversy, we remember statements in the literature of the Electricity Publicity Committee of which (as mentioned already) Mr. Cramb is the Vice-Chairman, as we read the following passage in his letter on the organization of the electrical industry: "All that is now required is to get the Industrial Committee composed of energetic, keen business men, with broad-minded views." With broad-minded views! We linger over those words, and become reminiscent.

The Wiring and Hiring and Unprecedented Finance Powers Bill, promoted by the Municipal Electrical Association for the purpose of giving unlimited scope to speculation on the part of municipal electricity departments, as is known, has been hung up for the session. But pourparlers have been quietly proceeding, with the view of getting the electrical contractors anchored to an agreement, in order that a sort of confederacy may be brought about in support of the Bill when it comes up for serious consideration by Parliament. So far as we are aware, no actual agreement has yet been arrived at between the municipal parties and the private contractors; but there are municipal electrical engineers who are confident of a working agreement. Of this we may be very sure, that the contractors will not give up the strong position that they hold for a mere mess of potage. The decision against the Leicester Electricity Committee came as an awful blow to municipal trading in electric wiring and fittings; but the dual defeat of the Sheffield Corporation in the Law Courts and then, over their Bill, in the House of Lords, fairly shook the breath out of the bodies of the extreme municipal traders. It had, however, the good effect of making them look with a great deal more respect upon the contractor, and to court him as the strong and influential man. But the contractors will be very silly if they are won over by adulation to renounce the far-reaching effects of their well-fought-for victories.

The "minor" failure, which seems to be a thing to be expected in connection with electricity supply, with a larger one occasionally by way of variation, is having an extraordinarily large amount of illustration just now. Of course, these small failures (as was shown last week) are not looked upon by the electricity vendor as being at all important. A minor failure is one that, we gather, may last anything from five minutes up to (this is the limit of classification seen so far) three hours, during which time those who rely upon electricity only as an illuminant must sit patiently in darkness meditating on the uncertainties of life, and of the electric light in particular. Islington, not long since, had a general collapse of its electricity supply, which was not regarded as a minor affair. On the evening of the 11th inst., part of the borough had another similar experience—Highbury being the district affected, and the duration of the extinction is stated to have been only ten minutes. The report before us names certain places in the area where no particular trouble was experienced; but it does not mention the places where trouble was experienced. The report makes quite a point of this—that there was no trouble on this occasion at the Great Northern Hospital or at the local Infirmary. These are places where the public realize that there should be (as in places of entertainment where large audiences assemble) the highest possible reliability in the lighting arrangements. Yet another "minor" extinction occurred at Lewisham and Catford on the 7th inst. All who were depending upon the electricity service for lighting were deprived of it for eight minutes, owing to a breakdown at the electricity generating station. On the evening of last Friday week, Cardiff also suffered a "minor" collapse, which brought about general confusion in streets and premises lighted electrically.

Bearing upon this subject of breakdowns and fires at electricity supply stations, the Hackney Borough Council Electricity Committee have been investigating "the position of the Council's works as regards the possibility of breakdowns due to fire;" and they seem to be satisfied that all is well and fireproof at Hackney. Naturally (there is caution here) "it cannot be certified that a burn-out would be impossible; but the Committee are confident that it would be most improbable." In the extension works that have recently been designed, combustible material has been practically eliminated. "The switchboard will be of metal, brickwork, concrete, and porcelain only, the cables will be lead sheathed and copper sheathed; and there will be so few of them that there will be no two cables so close together that a burn-out on one would affect another." It will be noticed that the Committee here speak with a little reserve. They know something about the uncertainties of electricity. They know, too, the need, if prevention of destruction by fire is to be assured, of fitting buildings to electric lighting and not electric lighting to buildings. In other words, they are aware that electric lighting is likely to be fairly safe when used in an iron and concrete structure, and out of reach of combustible fittings and material.

Speaking of the safety of electric lighting, and of the frequent contradictions that electricians are treated to as to the truth of their assertions, we are reminded that it was only the other week that we had a short list of fatalities that had occurred through men, a woman, and a child coming into contact with live electric wires. There is another short list before us. The overhead cable supplying the saw-mills of Messrs. J. Jones and Sons, of Larbert, broke and fell during a recent storm. A boy was afterwards found lying by the cable—dead. An inquest was held a few days ago on the body of a man, named Welburn, engaged at Sparwood mine, near Guisborough. An electric wire was hanging about 6 feet above the ground. Welburn was heard to shout, and some workers found him lying on the ground with the live wire in his hand. The man died. The voltage was only 250. A labourer named Paul Lyons was killed on the 30th ult. by an electric shock while working on the premises of Messrs. Bibby in Liverpool. Two men named Creaser and Goddard who were engaged in painting at the Staveley Coal and Iron Company's works received fatal electric shocks last Thursday. At the hospital it was found that the first-named man was burned through the body, practically from head to foot. These points are mentioned just by way of showing that between theoretical safety and practical safety there is an awful chasm. In this connection, it is observed that the Hampton-on-Thames District Council have, owing to their experience, come to the conclusion that the local firemen ought to have rubber gloves for use at fires caused by electricity. Fires "caused by electricity!" Who said there were any? Who said that newspaper reporters had "fusing of electric wires" on the brain?

Electric cooker appliances continue to receive notice in the electrical press; and our old friend Grogan is still busy courting admiration with puff pastry, wafers of toasts, and shavings of bacon—the while refusing to be drawn into any public competition with a gas-oven. An article in the "Electrical Review," headed "A Few Remarks on Cookers," has invited our attention. Though the article extends to over two columns, the title is not inappropriate. The author is Mr. E. P. Austin, Assoc.M.Inst.E.E. He is an optimistic gentleman; and optimism is a very good quality for giving support in connection with this matter. He believes that the electric cooking and heating load will result in the consumption of energy for domestic purposes forming one of the principal items of the central station output. The article is spoilt by the absence of statement as to the commercial and other grounds on which belief is based. It is very commonplace merely to say that the practicability, and in many respects the superiority,

of electric cooking has long been well established. Something more substantial than this is required from one whose optimism rises to such a high peak as that of Mr. Austin. He acknowledges, however, that there are misgivings as to the reliability of electric cooking apparatus; but it is rather curious that he regards these misgivings as "only the remnants of prejudice, germinated by unpleasant experiences of comparatively remote date." It was only lately that a user of an up-to-date electric-cooker walked into the offices of a provincial gas company, and bought outright a gas-cooker, because, as he said, he liked his meat well baked, and he had had some little difference of opinion with the electric-cooker as to whether he or the cooker should be arbiter of the time that meals should be served.

Mr. Seabrook and Mr. Holmes, of Marylebone, trenchant competitors as they are of gas, take the practical view that badly constructed electrical apparatus (which means short life and unwelcome experiences) will, in the long run, do more injury to the cooking branch of the electrical business than the happy-go-lucky electrical man thinks. They are right; and they refer to apparatus at the present time on the market, which germinate not remote, but current, unpleasant experiences. Mr. Austin appears to have been satisfied that all is well in this respect by "the robust construction and the ingenuity displayed in the design and application of various standard heating elements." Our experience in many matters structural and operative goes far enough back to have taught us that outward and visible signs must not be the sole arbiter of efficiency. We continue to wander through the mass of commonplace statement in the article, looking for substance from Mr. Austin to support him. But there is utter failure in the exercise. He is, however, found saying that, for a £20 to £35 house in the provinces, a cooker output, with a maximum possible demand of 2500 to 3000 watts per hour, should be installed; but where there are six or eight persons in family, a cooker of 4500 watts capacity should be preferred, which suggests to us that, in his first estimate, he has allowed only for a liliputian household, and no margin for visitors. But, after all, he acknowledges the great difference there is between the cost of gas-cooking appliances and electric-cooking appliances and their installation. There is also, farther on in the article, a little discounting of his earlier views on robustness and quality; for he advocates a cheap line of fool-proof cookers, and supplements this a little later on by saying "the makers are inclined to be optimistic in their claims for the capabilities of these things, and it is well for electricity supply people to act cautiously in this direction, or a device, excellent in its way, may produce a wrong impression on a consumer through injudicious description." That is excellent.

It is also observed that Mr. Austin advocates that electric radiators should not be used directly in front of an open fireplace. His reason, however, will be extremely interesting to any student of physics. He says: "The hot air does not, *as a rule*, pass up the chimney, as the chimney is cold. But a cold draught comes down the chimney, and brings soot with it to be deposited on the walls by the heated air from the radiator." Is that the "as-a-rule" experience of the working of chimneys? When one gives consideration to the purpose of a chimney, no self-respecting chimney will be flattered by Mr. Austin's views as to the "as-a-rule" reversal of its functions. As to the soot trouble, electric-radiators do not produce smoke; and, before one is installed, the services of a chimney sweep ought to prevent the trouble that Mr. Austin has in mind. We have known something of the kind to happen such as he represents with a coal fire in a room, and an electric-fan in operation—where the cubical capacity of the room was not large, and where the suction of the fan was greater than the power of the chimney to keep the products of coal combustion in their destined path.

According to a statement in the "Daily Express," Professor Bone, in conjunction with Mr. C. D. M'Court, has invented a machine that will toast 100 million slices of bread in eight hours; and they are now engaged in perfecting the details. The slices are said to be attached to an endless band of steel which runs between two plates raised to an intense heat by Professor Bone's well-known system.

M. Macé has taken out a patent for France for a photometer of the type in which a photographic plate is exposed to the source of light for a certain time, developed under definite conditions, and then compared with a set of standard plates, which may have been prepared similarly from a standard source of light. According to an abstract of the specification contained in the "Journal of the Society of Chemical Industry," the apparatus comprises a plate-carrier and a developing machine. The plates are stored in a magazine, and are pressed upwards by a spring, so as to enter one by one a recess in a slide in the base board. The plate is carried from the magazine by moving the slide to its central position a tube directed towards the source of light is brought over the plate, and the exposure is made. The slide is then moved again, so as to deliver the plate into the developing machine, which is a separate piece of apparatus having a receiving-tube to fit over the discharging-tube of the plate-carrier. The exposed plate is received in a recessed slide, and carried by it to the developing-tank, which is of the same shape as the magazine. The developer is stored in a reservoir connected with the tank, and the liquid is transferred from one vessel to the other, for developing and washing the plate, by means of a pressure bulb.

THE QUALITY OF LONDON GAS

In the Third Quarter of 1912.

A SUMMARY, in the customary form, of the results of the testings made in the official testing-places controlled by the London County Council, of the quality of the gas supplied by the three Metropolitan Gas Companies during the third quarter of the year —*i.e.*, the thirteen weeks ended September 28—is given in the appended tables. The corresponding figures for the second quarter of the year were given in the "JOURNAL" for August 6, p. 381, and for previous periods in articles to which references are there given.

ILLUMINATING POWER.

The average results of the testings of illuminating power with the standard No. 2 "Metropolitan" argand burner are shown for each Company in Table I. for the past quarter and the corresponding quarter of 1910 and 1911.

TABLE I.—*Averages of All the Testings of Illuminating Power for the Third Quarter of the Year* [*Candles*].

Company.	No 2 "Metropolitan" Argand.			Flat-Flame.		
	1910.	1911.	1912.	1910.	1911.	1912.
Gaslight and Coke Company . . .	15·17	14·92	14·54	8·96	8·70	8·37
South Metropolitan Gas Company . .	15·85	15·73	15·44	10·24	10·04	9·35
Commercial Gas Company . . .	14·79	14·57	14·83	8·71	8·32	8·41

There has been a reduction of about one-third of a candle in the average illuminating power of the gas supplied by the Gaslight and Coke Company and the South Metropolitan Gas Company, as compared with the third quarter of 1911; but, as compared with the second quarter of the present year, there is no considerable change. The minimum results for the quarter of the testings with the standard argand burner were: For the Gaslight and Coke Company, 12·76 candles; for the South Metropolitan Gas Company, 14·02 candles; and for the Commercial Gas Company, 13·42 candles. In each of the thirteen weeks of the quarter, there has been at least one return of the gas supplied by the Gaslight and Coke Company below 14 candles; in two of the thirteen weeks there has been at least one return between 13 and 13½ candles; and in one week—viz., the last of the quarter—a return below 13 candles. The latter return, unless it was brought about by some unavoidable cause or accident, or subsequently disproved as incorrect, will render the Company liable to incur a forfeiture. In respect of the returns between 13 and 13½ candles, the Company are liable to incur a forfeiture only if the average of the return in question and of the returns for the preceding and following day is below 13½ candles. The gas supplied by the South Metropolitan Gas Company was well above the standard illuminating power of 14 candles on all occasions. The Commercial Gas Company had returns below 14 candles in two weeks of the quarter; one of these returns being slightly below 13½ candles. It is improbable that the average of three days' returns for this Company will in any instance have been below 13½ candles; and therefore it may be premised that this Company will not have become liable to forfeiture for deficiency of illuminating power in the past quarter. The minimum results obtained with the flat-flame burner during the quarter were: For the Gaslight and Coke Company, 7·34 candles; the South Metropolitan Gas Company, 8·05 candles; the Commercial Gas Company, 7·65 candles.

CALORIFIC POWER.

The results of the testings of calorific power of the gas supplied by each Company are summarized in Table II. for the past quarter and the corresponding quarter of 1910 and 1911.

TABLE II.—*Summary of Testings of Calorific Power* (*Gross and Net*) *for the Third Quarter of the Year* [*Calories per Cubic Foot*].

Company.	Average.			Maximum.			Minimum.		
	1910.	1911.	1912.	1910.	1911.	1912.	1910.	1911.	1912.
Gaslight and Coke—									
Gross	137·2	136·6	135·5	147·0	153·4	144·3	127·5	127·8	125·6
Net	122·4	122·2	120·8	132·2	138·0	129·3	113·3	115·5	110·2
South Metropolitan—									
Gross	145·8	143·5	143·1	157·0	160·3	153·1	135·7	133·5	131·7
Net	129·8	128·1	127·4	140·5	144·5	137·7	120·1	119·0	116·6
Commercial Gas—									
Gross	137·6	135·0	135·9	153·4	150·4	149·6	125·7	123·6	126·2
Net	122·8	120·7	121·8	137·9	133·3	134·4	112·4	110·6	112·3

The average calorific power of the gas supplied by the Gaslight and Coke Company is rather more than 1 calorie per cubic foot lower than in the corresponding quarter of 1911; but the average

for the other two Metropolitan Companies shows little or no falling off. The Gaslight and Coke Company in two weeks of the past quarter had returns of net calorific power below 112½ calories, which is the figure below which the average of three consecutive days' testings may not fall without the Company becoming liable to incur a forfeiture. It is impossible from the data available to say whether the results of the testings on the preceding and following days will have in these two cases raised the average above the penalty limit. Neither the South Metropolitan Gas Company nor the Commercial Gas Company are under any statutory obligation in respect of calorific power. But it may be remarked that the South Metropolitan Company's gas was well above 112½ calories net throughout the quarter; and the Commercial Company's gas only once fell below it, and then only to the extent of two-tenths of a calorie. Having regard to the new standard of calorific power introduced by Parliament in the South Suburban Gas Company's Act of last session, it may be useful to observe that the nominal standard of 475 B.Th.U. gross per cubic foot prescribed in that Act is well below the minimum returns for the three Metropolitan Companies in the past quarter. For comparison with this standard, it may be worth while stating here that during the past quarter the gross calorific value for the Gaslight and Coke Company averaged 537·7 B.Th.U., with a minimum of 498·4 B.Th.U.; for the South Metropolitan Company 567·8 B.Th.U., with a minimum of 522·6 B.Th.U.; for the Commercial Company 539·3 B.Th.U., with a minimum of 500·8 B.Th.U.

Sulphur.

A summary showing the average and maximum results of the testings of the amount of sulphur contained in the gas supplied by the three Companies during the third quarter of the last three years is given in Table III.

Table III.—*Summary of Testings of the Sulphur in London Gas for the Third Quarter of the Year* [*Grains per* 100 *Cubic Feet*].

Company.	Average.			Maximum.		
	1910	1911.	1912.	1910.	1911.	1912.
Gaslight and Coke Company . . .	37·3	34·1	35·7	71·9	58·5	52·5
South Metropolitan Gas Company .	30·3	27·1	24·3	52·3	49·4	43·0
Commercial Gas Company . . .	26·6	29·8	30·7	43·2	61·7	42·1

Nothing in these results calls for comment except the reduction in the twelve months of nearly 3 grains in the average amount of sulphur in the gas supplied by the South Metropolitan Company. The average for the past quarter is, however, practically the same as in the second quarter of the present year.

COOKERY AND HEALTH AND DISEASE.

With Some Comparative Costs of Gas and Electricity in Cooking and Water-Boiling.

If there was more common sense exercised in cookery in this country, our health and disease records would show a vast improvement. That is the deduction to be drawn from the first of the educative series of lectures that is being delivered by Dr. F. S. Toogood, M.D. (London), Barrister-at-Law, in the Lecture Hall of the Society of Medical Officers of Health, at No. 1, Upper Montague Street, W.C. In these lectures, Dr. Toogood is being assisted by Dr. R. Dudfield, Dr. R. A. Lyster, Dr. Joseph Priestley, and Mr. William Lawton, the Executive Secretary of the Society of Medical Officers of Health. The lectures are remarkably interesting and enlightening. On the first day, after Dr. Toogood and Mr. Lawton had lectured, Dr. Lyster dealt specially with the subject of the importance of good food and cookery in the treatment of tuberculosis, and not only in the treatment, but in the prevention. If the poorer part of our population had better food and cooking, there would be less trouble from this cause. But so far as cooking goes among the poorer part of the population, their drawback is the non-possession of ready facilities for proper cooking. When solid fuel has to be bought and stored, and fires made and maintained for the purpose of cooking, there is a disposition to neglect the cooking, or to do it in an indifferent or slipshod manner. We hear much about pure air, sanitary conditions, but very little about the importance of this question of cooking, which, when it is badly done, begets disease, and disease contributes to unwholesome conditions.

Gas undertakings come in here. They can, through the prepayment meter system, give the necessary facilities for proper cooking being carried out in the houses of the poorer class. They carry fuel right up to the cooking-stove. It is there ready for use; and a penny, or part of one, is the only expenditure claimed for cooking a meal. Thus, how gas undertakings can operate in assisting to improve the health of the poorer section of the community is apparent. At the second day's lectures Dr. Toogood referred to a letter Mr. Lawton had received from Mr. F. W. Goodenough, the Controller of the Sales Department of the Gaslight and Coke Company, in reference to Dr. Lyster's remarks as to the value of good cooking in the treatment of tuberculosis. In his letter, Mr. Goodenough said he was sure Dr. Lyster would be glad to know that, except in a few cases where the cost of fixing would prove prohibitive, the Gaslight and Coke Company would always put into the houses of the poor a gas supply, with a gas cooking-stove or griller, free of charge, on the slot system. Then followed this interesting statement: "It will interest you to know that we have at present 456,532 customers using gas for lighting, cooking, &c., on this system, and that these customers have a total of 351,939 cooking-stoves, grillers, gas-fires, and water-heaters in use." Dr. Toogood commented on this, remarking that if all gas undertakings did this sort of thing, it would, at any rate, give people an opportunity of having well-cooked food, which was so desirable. But he emphasized the fact that it was also essential that poor people should be taught how to use these conveniences to the best advantage.

In this same lecture, Dr. Toogood spoke about the fuels used in cooking, and he took us back to the cooking modes of primitive man, and then traced the heating agents from wood to coal and to gas and paraffin oil, and then to electricity. With regard to the relative values of these different fuels, there is a great deal to be said. In the ordinary way, he supposes that still, in the vast majority of households, cooking is by the burning of coal. This is a very wasteful manner of applying heat, because the fire is usually lit for a long time before it is wanted, and remains alight a long time after its service is not required. He recalled how on one occasion he went over the Oxford Colleges; and just before hall dinner, he noticed an enormous fire—it must have been two yards across, and a yard high, but, of course, not very deep. This enormous fire was being devoted to cooking one chicken and one leg of mutton! He calculates that there was 2 cwt. of coal on the fire at the time. Waste like this or the more ordinary kind is not found with the gas-cooker.

Presently, Dr. Toogood came to the results of a number of experiments made specially for the lecture, as to the relative value of gas and electricity in cooking. These are the figures that the doctor presented in more extended form:

Joint.	Electricity. Units.	Pence (at 1d. per unit).	Time. Min.	Gas. Cubic Feet.	Pence (2s. 6d. per 1000 c. f.).	Time. Min.
Neck of mutton .	1·54	1·54	75	12·8	0·40	60
Ribs of beef . .	2 30	2·30	97	17·2	0·53	75
Leg of mutton .	3·13	3·13	140	21·6	0·67	95
Average cost . .		2·32			0·53	

It was explained by the lecturer that these tests were carried out with joints of similar weight and as nearly similar in other respects as it was possible to get them; and the "Bastian" electric-cooker and the "Bungalow" gas-cooker were used. Taking the average costs for the three types of joints, it is seen that the figure was 2·32d. for electricity and 0·53d. for gas—*i.e.*, electricity for cooking purposes is about 4·4 times as expensive as gas. In similar comparisons between an ordinary gas-cooker and a "Tricity" electric-cooker, the cost of electricity was about 3¼ times as expensive as gas for baking purposes. When electricity was used for boiling water in a kettle—specially constructed with well-finished flat bottom so as to get good contact—it was found to be 4½ times as expensive as gas, and the water took about twice as long to boil. Oil is about 1¼ to 1½ times the cost of gas for boiling purposes; and coal works out to about twice the cost of gas for cooking purposes. Comment was passed not only on the difference in cost, but on the difference in time required to do the same work. Thus it is seen that, at present, electricity is unable to compete with gas so far as cooking is concerned—that is to say, both baking and boiling; but there may be developments later which will enable electricity to make a better showing than at present.

Mr. Lawton succeeded Dr. Toogood, and demonstrated with the kitchen range substitute, in which gas is used as described in an article that appeared in the "Journal" for Sept. 17 last (p. 751). Everything that he did with it turned out successful; for Mr. Lawton is, beyond his other attainments, an adept cook, and a master of hygienic cookery. During the demonstration, he made, before the audience, trials with water-heating, using an "electric-ring" and a gas-ring. First, starting cold, he boiled on a gas-ring, in an ordinary block tin kettle, a quart of water. Eight minutes were occupied, 1·62 cubic feet of gas were consumed, and the cost of the gas at 2s. 6d. per 1000 cubic feet was 0·05d. On the "electric ring," an enamelled saucepan was placed, containing a quart of water. When the kettle boiled on the gas-ring, the water in the saucepan on the electric-ring was only just warm. Then the saucepan and the kettle were both cooled; the saucepan containing a quart of water was placed on the gas-ring, the kettle containing the same quantity of water on the "electric-ring." The heating element of the latter was still hot. The boiling by gas of the quart of water in the saucepan occupied eight minutes, the consumption of gas was 1·5 cubic feet (the gas-ring was still warm when the saucepan was put on), and the cost, at 2s. 6d. per 1000 cubic feet, was therefore within 0·05d. The quart of water in the ordinary tin kettle on the electric-ring occupied, in reaching boiling-point, 23 minutes, the consumption of electricity was 0·3 unit (the "ring" was hot from the previous experiment), and the cost was 0·3d., at 1d. per unit. The ratio of cost for electricity and gas, under these conditions, is 6 to 1. In the previous experiments, it was 4½ to 1, using, with the electric-heater, a specially constructed kettle. Mr. Lawton made two batter puddings—baking one in

the gas-oven, and putting the other in a frying-pan on the top of the electric-heater. The trial with the latter was only made to see what would happen. The batter pudding in the gas-oven was properly baked; but the batter pudding in the frying-pan on the electric-heater turned out a ghastly failure. It was converted into a pancake, with the bottom burnt and the top not done at all. Mr. Lawton put the failure down to the fact that there are only two regulations of heat with the electric-heater used—full-on and half-on; and he complains of, with the electric-heater, the want of the same facility for the adjustment of temperature at any point as is realizable with the handy gas-tap.

Those present enjoyed the afternoon's lectures and demonstrations immensely. One thing that was noticed was that the electric fan used for ventilating the lecture-room has been superseded by a gas hot-air fan, on account of the noise that the former made.

NEW MANTLES AND NEW PROCESSES.

Under J. I. Robin's Patents.

In the early part of this year, an article appeared in our columns (Jan. 30, p. 274) describing what was then known as the "Strand" mantle, and the system of making it—the machine and the new process of mantle making (both complete novelties in the mantle trade) being the invention of Mr. J. I. Robin. Since then, Mr. Robin has added those little touches to his mantle making and finishing machines that give to them an extended perfection in operation and product, and in increase of output. Now the time has arrived for commercially exploiting the new mantle making process; and Mr. Robin is confident that the characteristics of the mantles are such that they will widely commend themselves, and win their way to large favour, solely on their merits. But to provide the means for establishing the business, he has entered into arrangements for the formation of an initial Company, with a capital of £30,000. This Company will be known as the Robinlyte Amalgamated Companies, Limited, with registered office at 69, Basinghall Street, E.C. But the work of mantle making will be conducted at 111 to 113, Titchfield Street, W. Here are found large six-storey premises; and at the start 25 of the Robin machines, in their improved form, are to be established there. The machines have a maximum capacity of fourteen gross a day each; so that the output of the factory will be a substantial one from the beginning. That a mantle factory can be situated in such a central position in London with as much safety as any other building dealing with fabrics is due to the fact that, as will be remembered, mantles of "Robinlyte" type are uncollodionized, so there is no danger from the use of this volatile and inflammable stiffening substance.

The "Robinlyte" Mantle.

Last Wednesday, there was a demonstration at the Hotel Cecil of the process of making mantles with the Robin machines and methods. But our readers do not require—in view of the article already referred to—a detailed description of either. The salient features of the mantle may, however, be recalled. In the first place, the Company are not going to trouble about the production of mantles of the vertical form; as they are convinced that it only means time for the lower gas consumption, the increased efficiency, and the longer life of inverted mantles to gradually sweep away the vertical form. The mantle, which was originally known as the "Strand" (but which name has now been dropped in favour of the "Robinlyte") is formed of a number of loose corrugated strands or threads (the corrugations being obtained as described in the previous article), which threads are flexible and uncollodionized, and shape themselves to the flame of the burner on which they are used. There is no limit to the number of threads that the mantle may contain; but the number decided upon has been a matter of experiment, and, of course, has relation to the size of the mantle—whether for the ordinary, medium, bijou, or out-size burners. In the manufacture of the "Robinlyte" form of mantle (there is also the "Nutred" mantle, to which reference will be presently made), cotton is employed; the impregnating solution contains 99 per cent. of thorium and the full 1 per cent. of cerium. The mantle is completed ready for use in five processes, in which little is left to individual discretion. It is, in short, a mantle which, in its production, comes in for considerable mechanical precision and control. The flexibility of the mantle is a great consideration in connection with transport, and placing in position on the burner; and there economy from a consumer's standpoint is found. The only thing that is different from the use of the ordinary mantle is that the consumer on placing the "Robinlyte" mantle on the burner has to burn-out the fabric by the gas-flame; and then, after regulating the gas and air, the mantle will adjust itself to the shape of the flame of the particular burner on which it is to do service.

The "Nutred" Mantle.

In addition to the cotton mantle, Mr. Robin has been investigating the use of a special artificial silk in the production of the mantles. As a result, a mantle is coming out to be known as the "Nutred." The principles and processes of manufacture, other than the special fabric, are precisely the same as in the "Robinlyte" form. Mr. Robin is of opinion that the new fabric makes a flexible mantle whose virtues are greatly superior to those of the cotton form. But for a brief space, patrons of the uncollodionized, flexible mantles will have to content themselves with the merits of the cotton form, as arrangements have to be made at the Company's factory for the production of the special silk ones. The "Nutred" mantle is pretty in its unused state; in use at the demonstation, its efficiency from the illuminating point of view was unmistakable; and as to the greater resiliency, there could be no question. The chemically treated fabric of this new mantle was examined; and it was pointed out that there are no less than 25 of the silken strands in each thread, and that the thread is continuous. The threads of the new mantle lie together closely when the mantle is in use; and one gets the impression of a solid shapely incandescent substance. In durability tests, we were informed, the mantles have survived 50,000 shocks. Mr. Robin is of opinion that he has now produced a mantle the elasticity of which it is impossible to exceed.

The "Robin" Mantle Machines.

The novel machine on which these mantles are made (as described last January) have been improved, so as to make their working even more precise, their manipulation easier, and to place their capacity on a higher scale. They can now be fed with a sufficient quantity of material to last for a maximum output for one week. The general appearance of the machine has been improved; and the machine has been made portable, so that it can be placed anywhere, and moved, if necessary, to more convenient quarters in the workrooms at any time. The finishing-machine has also been improved—rendering it more positive in its action. These are all refinements; and they have all contributed to a still more pronounced perfection in these flexible, uncollodionized mantles.

THE ORIGINS OF GAS LIGHTING.

The new "Italian Gas Review" (the first issue of which was referred to last week), contains an article under the above title, which, though without recording any fresh facts, expresses concisely some cardinal features of the early history of gas, and seems—especially in this centenary year of the grant of charter to the premier gas company—to merit translation. It will, perhaps, prove interesting to those who are attracted—and who is not?—by the early history of our industry, more particularly as it is one of few articles of foreign origin which endeavours to mete out just measure as between the claims of Philippe Lebon and William Murdoch, though we note the omission of any reference to Minckelers. We would further suggest that any student of gas history should, of course, amplify and check any dates given or statements made, by referring to the actual evidence available, and to such published researches as Mr. Charles Hunt's valuable "History of the Introduction of Gas Lighting." With this cautionary advice, the following translation is given.

The first invention relating to the manufacture of illuminating gas is attributed to a Frenchman, Philippe Lebon, who was born at Brachay, Haute-Marne, on May 29, 1767. It was about 1789 that Lebon (who was an able chemist), while making investigations into the properties of smoke coming from the combustion of different materials, found that the smoke given off from a glass phial containing wood sawdust, exposed to the action of outside fire, lighted up on contact with another flame, and gave a bright light. Extending the field of his experiments, he very soon constructed a more perfect apparatus, suitable for the complete carbonization of the wood, and producing a gas which, passing through an elementary purifying process—condensation and washing with water—gave a sufficiently bright and pure light. Following upon this, Lebon designed and made an apparatus called a "thermolamp;" and about the year 1796 he applied it to the lighthouse at Havre. He patented it in 1799, after having described it to the Academy of Science. The same year [Translator's Note.—It was in 1804.] on Dec. 2, Philippe Lebon was assassinated. His widow continued his studies and applications with success.

It cannot be truly said that Lebon was the inventor of gas lighting, although he may have indicated coal as the first material to be substituted in place of wood, and may have foreseen main laying in streets for the distribution of gas in cities. The originality and importance of his discovery consist in the process of distillation of combustible materials, of their perfect carbonization in closed vessels, and of the condensation of the smoke, in order to separate the solid, liquid, and gaseous parts of it.

While Lebon was engaged in France in these researches, in England William Murdoch, in an essentially practical spirit, was carrying the laboratory experiments into the industrial arena; so that in 1792 he succeeded in lighting a dwelling-house regularly with gas. This success encouraged him to attempt larger plant up to the year 1798, when he achieved the lighting by gas of Watt's works for the construction of steam-engines at Soho, near Birmingham. From this period, dates the beginning of the practical use of gas lighting.

In Murdoch's plant, the distilling apparatus was at first a cast-iron vertical retort; then modified by a bottom curve and opening for drawing out the coke; afterwards there was an inclined retort open at both ends; and, lastly, a horizontal retort with mouthpiece, ascension pipe, &c., which still exists to-day. Murdoch was the first to collect the gas into gasholders, and was also the first inventor of rudimentary apparatus for washing, purifying, distributing, and of burners with taps, &c.

But the first to spread the use of gas in England was a German,

who previously in Germany had been a travelling advocate of public experiments of Lebon's discovery. It was this German—of the name of Winzer, changed in England to Winsor—who was the first to seek, with the help of the chemist Accum, authority from Parliament in the year 1809. The Bill was rejected on account of the claims of Murdoch for priority of his invention and for the privilege which ought to be granted him for it. Nevertheless the German, with the tenacity characteristic of his race, succeeded the following year in establishing the first gas company, the "Chartered Gas Company," with a capital of £50,000. [Translator's Note.—The first Gas Bill (50 Geo. III., c. 163) became law on June 9, 1810. The Gaslight and Coke Company received its Charter on April 30, 1812; its capital being £200,000.] Afterwards, there became associated with the Company the best known pupil of Murdoch's, the engineer Samuel Clegg, studious and genial, who invented a number of ingenious appliances, the hydraulic main, lime purifier, station governor, &c.

Only in 1814, however, was the Company able to conclude a contract for the replacing of oil lighting by gas illumination in the parish of St. Margaret, London; and from this time dates public gas lighting. Very shortly afterwards the chemist Henry introduced other improvements in manufacture and purification, which enabled the new gas industry from that time to extend rapidly; so that in 1829 there were in England 200 gas-works. In France, after the death of Lebon's widow, no one concerned himself any longer with the problem of gas lighting; and again it was the German Winsor, who in 1816, after starting works in England, went over to Paris, and there attempted to introduce the new system, but with little success. The French Company was founded by Pauwels in 1820; but gas did not have any great development in Paris until 1855, when the Compagnie Parisienne du Gaz was established, which absorbed all the smaller companies and obtained an exclusive concession throughout the city for fifty years.

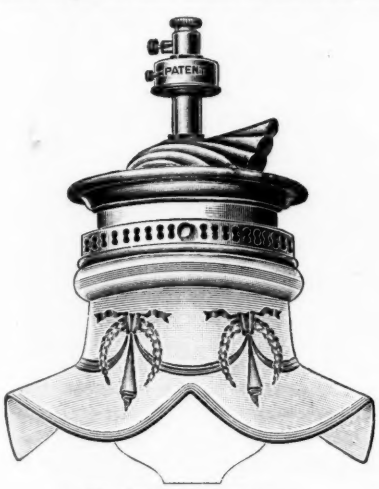
Between 1802 and 1816, some small installations of gas were put up in Germany with moderate success. In 1818 a first trial of lighting by gas in Vienna failed completely. Only in 1828, after many schemes and attempts, the streets of Dresden were successfully lighted by gas. For the rest, as well in France as in England, the development of the gas industry in the first half of last century was due to the spirit of initiative among English engineers and capitalists.

SOME "BLAND" NOVELTIES.

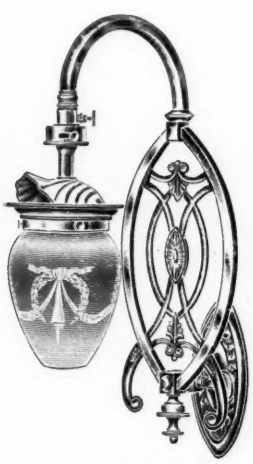
FOLLOWING up references that have already appeared to new and improved gas-lighting appliances which are being provided to meet the requirements of the present season, mention may be made of some of the more striking features in connection with the specialities of the Bland Light Syndicate, Limited, of No. 29, Little Trinity Lane, E.C.

The firm's recently issued catalogue contains particulars of many things that are fresh; but attention may first be drawn to their well-known pattern of inverted burner, which is made in numerous sizes. In the new heat-resisting type of this burner, the nipple portion is provided with an insulator of non-conducting material. The idea of this is to keep the fittings perfectly cool, and prevent them from becoming discoloured; and it effectually secures this end. The shell, or hood, also of the different types of burners is now formed of a new made-up metal which is not at all affected by heat. In fact, a burner which has been in use at the offices of the Syndicate for some four months past looks still in every respect just as when new. Then there are some neat reversible angle burners, which can be had with or without the shell and bye-pass. They are finished in polished brass, steel bronze, or oxidized copper. To glassware the firm have been paying special attention, with the result they have a very large stock of globes and shades for universal, intermediate, bijou, and "H.P. (self-intensifying) burners. There are patterns to suit all tastes—and pockets. Many of them are attractive because of their highly ornamental character; while others are equally pleasing on account of their simplicity of design. Beaded shades are still extremely popular; and there are a good assortment arranged for "Bland" burners, and fitted with metal bands in gilt, oxidized copper, or silver finish.

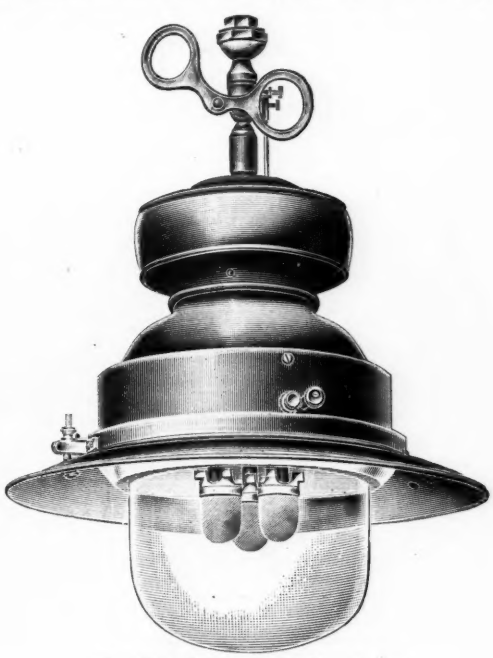
The firm, of course, supply many forms of lamps intended for exterior lighting; and in this connection mention may be made of the new type "Blanlite" outdoor lamp, in two, three, and four light sizes. This is a British lamp, and is made by the Syndicate themselves. It is wind and rain proof and shadowless, and it has been designed with a view to inexpensive maintenance. For one thing, no inner cylinders are used—a fact which is regarded as of importance from an economical point of view. It is made in copper and enamelled, and is fitted with "Bland" angle burners. It is a good looking lamp; and the makers point to the demand as being proof that it is as good as it looks. The short lever-arms shown are found convenient where there is little space at the top of the lamp. There is also the original "Blanlite" outdoor pattern, with three burners and inner chimneys (which is lower in first cost), and one, two, three, and four burner lamps bearing the same name for interior lighting. With another form of three-light outdoor lamp—the "Blanlite" high-power low-pressure pattern—the firm claim that they are able to secure 1000-candle power, or 52 candles per cubic foot of gas consumed, at low pressure. A gas-regulator at the top controls the three burners, while there is a door in the casing which affords access to the needle-valve and air-regulator.



Bland New Type Burner.



An Artistic Wall-Bracket.



New Type "Blanlite" Outdoor Lamp.

The remark already made as to the range of glassware may be repeated in connection with the firm's selection of brackets and pendants. There are many pretty patterns, in brass, antique copper, and oxidized silver, with tasteful scroll-work and ornaments. A feature is made of pendants and brackets to match, for use in apartments where both styles of fitting are required.

Our final word to-day shall be devoted to a very neat little new hall-lamp attachment, made in numerous styles, for universal, intermediate, and bijou Bland burners. These attachments fit on to the burner in just the same way as an ordinary globe; and the result is quite a nice looking lantern, at an expenditure of no more than a very few shillings.

Addenda to Reeson's "Gas and Water Acts."

It was mentioned in the "JOURNAL" last week (p. 220) that Mr. Joseph Reeson has enhanced the utility of his well-known work by issuing a series of leaflets, for insertion, containing notes as to subsequent additions, repeals, and amendments. Mr. Reeson has since sent us a copy of the volume with all the *addenda* inserted, together with marginal references, stamped in red, near the parts of the text affected thereby. Of course, the work is complete without these references, though they are very helpful to the reader by indicating the exact position of the alteration. Moreover, attention is drawn to the leaflets by a slip inserted opposite the title-page

CHAMBER CARBONIZATION FOR GAS PRODUCTION.

KOPPERS' SYSTEM AT THE VIENNA GAS-WORKS.

By G. Stanley Cooper, B.Sc., F.C.S.

Recently the writer has devoted much attention to the study of the principal methods of chamber carbonization for gas-making purposes. This system is going ahead rapidly on the Continent; and at a number of places in Germany and Austria, gas from chamber ovens is used for town purposes. These chamber ovens are designed for the production of coal gas for town purposes; coke as a rule being of secondary consideration.

Through the courtesy of the Koppers' Coke-Oven and Bye-Product Company, of Sheffield and Essen (Germany), the writer has been given full facilities to inspect plants in Germany and Austria. It is proposed to deal only in the present article with the plant erected by Koppers at the Simmering (Vienna) City Gas-Works, where the writer recently spent several days in inquiring into the full working of the plant. The installation of horizontal chamber ovens is in addition to the usual retort systems, and also to a set of Koppers' inclined chambers and a water-gas plant. The setting was erected during 1910, and has now been working continuously over two years. Originally eighteen ovens were erected, but—and one can only judge this as a mark of the utmost satisfaction on the part of the authorities—another battery of twenty-eight ovens alongside the original setting, and a third battery of 72 ovens at another works, have been erected and are now in operation.

Each chamber is 10 metres long, 3 metres high, and 0·5 metre wide; and when charged and levelled the height of the coal is about 2·6 metres, leaving a clear passage for the gas on top of the charge. This is necessary, as the ascension pipe is at one end of the oven only. The top of the ovens must be kept clear to allow for the travelling coal filler, by means of which the chambers are charged. The charge put in each oven is about 11 to 12 net tons (1 net ton = 2000 lbs.), and the time of carbonization is twenty-four hours. For gas production, a guarantee is given by Messrs. Koppers that 100 kilograms of large Silesian coal shall yield 32·64 cubic metres of gas, conforming to a standard calorific value of 5100 calories per cubic metre at 15° C. and 760 mm. pressure; the gas being saturated with water vapour. No illuminating power guarantee is required—indeed the photometer at the gas-works has not been used for some time. The calorific value of the town gas is tested continuously by means of a Junkers' self-recording calorimeter—an instrument which is frequently

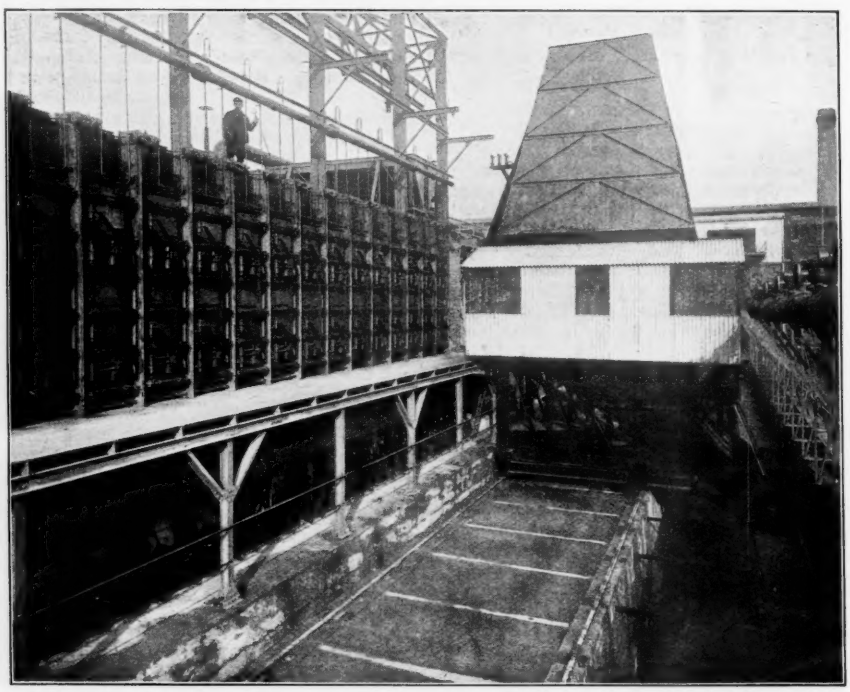


Fig. 1.—General View, showing the Discharging Side, Quenching Machine, and Coke-Conveyor.

employed on the Continent, and one which English gas engineers would be well advised in adopting.

With the German and Austrian coals, which often contain a large percentage of ash, it is customary to reckon all gas yields on per ton of pure coal—*i.e.*, coal with the moisture and ash subtracted from the total weight. This affords a good basis of comparison for coals containing different amounts of ash, &c. Under these conditions, the guaranteed amount of coal gas at Simmering is 35·48 cubic metres per 100 kilos. of pure coal charged. Koppers have also given a guarantee with regard to the amount of fuel used in the producer plant. The coke employed for fuel purposes must not exceed 11·9 per cent. of the coal charged, and of this coke, an average of 11·4 per cent. is ash; the coke being reckoned as dry. As the producer gas plant is separate, and hence the gas has to be driven to the chambers by a fan, the cost of the fuel necessary to run these mechanical arrangements has to be included in the 11·9 per cent. referred to. The arrangement of the producer plant is described later on.

A very striking feature of the Vienna installation is that all the work of charging, discharging, &c., is carried out during the day; there being only an experienced workman in charge at night. The chambers are charged between 7 a.m. and 6 p.m., and, if done continuously, at the rate of six ovens per hour. Seven men only are engaged.

In observing the charging and discharging of the chambers, one was impressed by the ease and rapidity with which these operations were carried out, with a minimum loss of gas. On one side of the setting is a large, combined pushing engine and levelling machine. By means of this, the whole mass of coke is pushed straight through the oven into a quenching machine, and here is rapidly quenched by jets of water; the latter being drawn by means of a pump from a tank which extends along the whole length of the setting. After quenching, the coke slides gently down an inclined plane into a travelling conveyor, by which it is conveyed to a distributor and there loaded into small trucks.

For charging the chambers, the machine runs on top of the setting, at one end of which is a large coal-store fed by means of an elevator. This store, and also much of the foundation work, is built of reinforced concrete. The charging machine has three hoppers charging into three corresponding openings in the chambers, and the coal is then levelled by the machine on the bench side. The whole operation of charging and discharging a chamber is completed in about nine minutes; and while charging and levelling, the chamber is connected with the gas-main.

The levelling beam going into the oven is enclosed in a gas-tight leather covering, thus rendering it possible to open the connection between the oven and the gas-main without any air being drawn in through the levelling hole. During the time that one oven is being charged, the next is open and the ascension pipes thoroughly cleaned and freed from tar, &c. In the course of charging, the slight suction in the main is sufficient to save most of the gas formed during the operation; and in addition steam is blown into the ascension pipe to help the passage of the gas. Hence very little gas is lost; and practically no air is drawn in. The gas-main connected with the ascension pipe is dry, except for the tar which forms there. Cool tar is also pumped in to help to

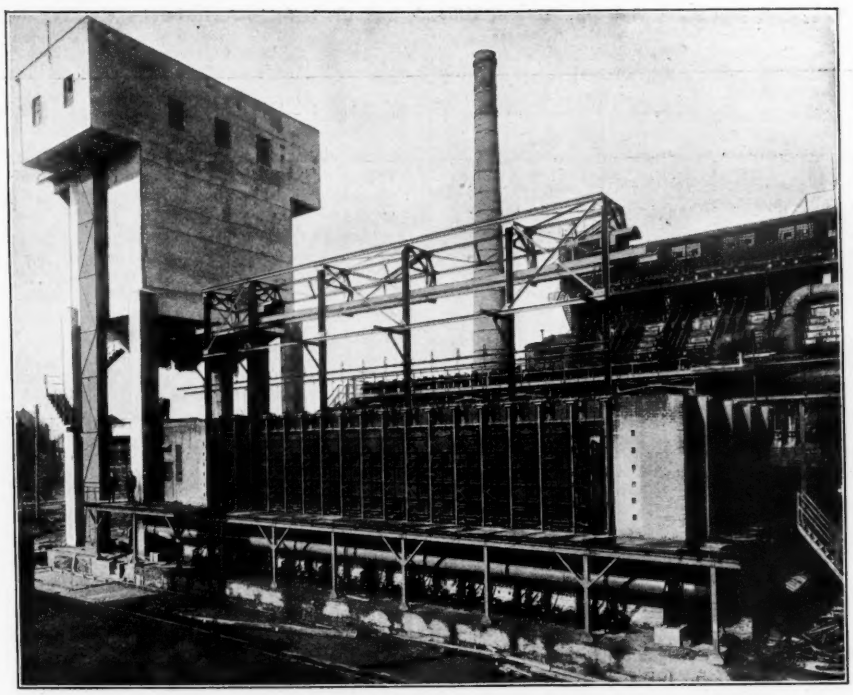


Fig. 2.—General View, showing the First Battery of Eighteen Ovens, Coal-Hopper, &c.

remove that which is newly deposited; there being an overflow at the end of the main. While the chamber is being drawn, a valve closes the connection between the oven and the gas-main. All the chambers are fitted with self-sealing doors. The frame of the door is cooled by means of a water-pipe. The whole arrangement works very satisfactorily; the doors being quite gas-tight.

The carbonization is carried out always for a period of twenty-four hours, and the whole of the gas is obtained. The coke formed is of good quality and size, and contains very little breeze. No trouble is experienced in the Koppers system with scurfing in the chambers. Occasionally deposits of scurf do form; but these are easily removed, or come off themselves during the pushing operation.

Generally, the average life of the lining of an oven is seven or eight years, depending largely on the nature of the coal used, and on the temperature of carbonization. In Vienna, the temperature of the interior of the ovens is about 1100° C. The temperature of the oven walls is very uniform, owing to the equal distribution of the producer gas for combustion, and the means provided for regulation. The supply and distribution of the gas to the individual ovens and to each of the vertical flues of the oven is easy to regulate and change. Through an opening on the top of the chamber the nature and temperature of the flame in each vertical flue can be observed, and alterations made as desired. When repairs are necessary, it is not a matter of great difficulty, as each oven is under entirely separate control, and the heat can be cut off from any one oven at any time and the brickwork easily removed. The same applies to the regenerator where both gas and air are heated prior to combustion.

The chambers are all heated by producer gas supplied from an outside producer. The producer plant is erected some hundred yards from the chambers, and sifted coke from the mixed coke at the gas-works is used. Each of the four producers is capable of dealing with 13 tons of coke per day. At the bottom of each

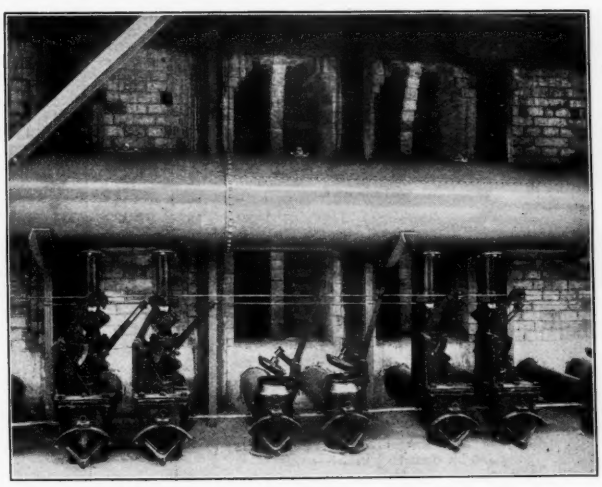


Fig. 3.—Producer Gas Main, Gas and Air Inlets, and Regenerators.

producer is a revolving grate; and the slag or clinker formed are crushed by an eccentric in the grate and are automatically

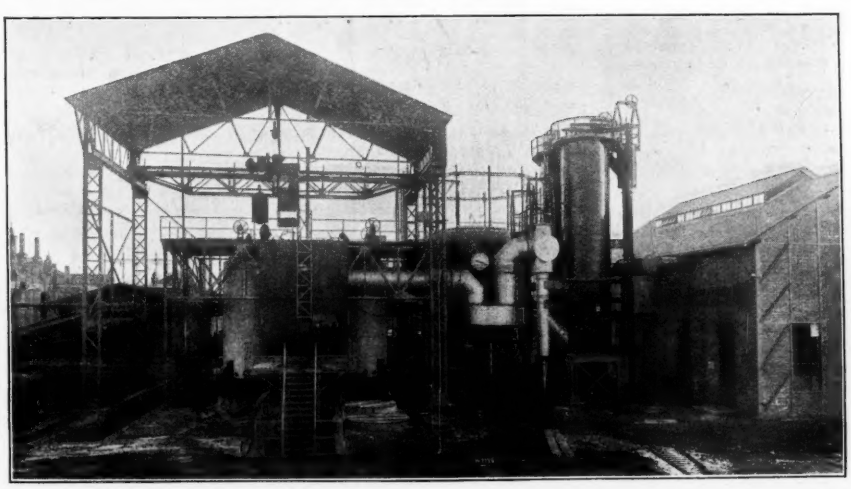


Fig. 4.—The Outside Producer Plant.

Official Guarantee Test made from Sept. 12 to 18, 1911, with the Battery of 18 Koppers' Horizontal Chamber Ovens at the Municipal Gas-Works, Simmering, Vienna.

Description of Tests.	First Day from Sept. 12 to 13, 1911.	Second Day from Sept. 13 to 14, 1911.	Third Day from Sept. 14 to 15, 1911.	Fourth Day from Sept. 15 to 16, 1911.	Fifth Day from Sept. 16 to 17, 1911.	Sixth Day from Sept. 17 to 18, 1911.	Total.	Average.
1.—Chambers in battery.	18	18	18	18	18	18	108	18
2.—Chambers discharged per day	18	18	18	18	18	18	108	18
3.—Guaranteed number of ovens	..	..	..	..	..	..	..	18
4.—Coking time per chamber . . . hrs. mins.	23 50	23 38	23 37	23 40	23 40	24 0	..	23 35
5.—Time in discharging and charging chambers mins.	9	10	9	8	9	9	..	9
6.—Coal carb. obtained from Ostrau Karwen district	..	..	..	..	..	..	..	..
7.—Analysis of coal—								
Water . . . . . per cent.	0·93	1·67	0·95	0·96	1·90	1·75	..	1·36
Ash . . . . . ,,	10·20	8·44	10·80	9·51	9·81	11·00	..	9·96
Pure coal . . . . . ,,	88·87	89·89	88·25	89·53	88·29	87·25	..	88·68
8.—Coal carb., inclusive of water and ash . tons	194·96	194·96	194·96	194·96	194·96	194·96	1169·76	194·96
9.— ,, ,, exclusive of water and ash . ,,	173·260	175·250	172·050	174·548	172·130	170·102	1037·340	..
10.— ,, ,, inclusive of water and 8 per cent. ash . . . . . tons	190·671	194·065	189·501	192·016	191·632	189·111	1146·996	..
11.—Weight of one charge of coal, inclusive of water and ash . . . . . tons	10·830	10·830	10·830	10·830	10·830	10·830	..	10·830
12.—Production of gas as recorded by gas-meter million cub. ft.	2·330	2·416	2·466	2·470	2·300	2·358	14·360	2·391
13.—Temperature . . . . . deg. Fahr.	75·2	75·2	75·2	74·3	72·5	71·6	..	74·0
14.—Height of barometer . . . . . in. mercury	29·8	29·7	29·5	29·4	29·6	29·7	..	29·60
15.—Pressure of gasholder . . . in. water-gauge	7·0	7·2	6·7	5·9	6·0	6 8	..	6·6
16.—Production of gas reduced to 59° Fahr., 30 in. barometer, 8 in. water-gauge pressure on gas-holder . . . . . million cub. ft.	2·210	2·285	2·310	2·314	2·204	2·248	13·571	2·262
17.—Guaranteed . . . . . ,, ,,	..	..	..	..	..	..	..	1·766
18.—Production of gas red. to 59° Fahr., 30 in. bar, 8 in. water-gauge . . . . million cub. ft.	2·254	2·330	2·358	2·360	2·248	2·293	13·843	2·307
19.—Amount of air drawn into chamber	..	..	..	..	..	..	..	..
20.—Production of gas per ton of guarantee-coal, 59° Fahr., 30 in. bar., 8 in. water-gauge . c. ft.	11,590	11,774	12,199	12,051	11,500	11,887	71,001	11,833
21.—Guaranteed	..	..	..	..	..	..	..	11,475
22.—Production of gas per ton of pure coal, 59° Fahr., 30 in. barometer. . . . . cub. ft.	12,999	13,286	13,695	13,512	13,049	13,469	79,980	13,330
23.—Calorific value per cub. ft. of gas, 59° Fahr., 30 in. barometer . . . . . B.Th.U.	612	618	623	606	610	602	..	612
24.—Guaranteed . . . . . ,,	..	..	..	..	..	..	..	572·7
25.—Calorific value of gas per lb. of coal, column 22 × column 23 ÷ 2240 . . . . . B.Th.U.	3554	3668	3811	3657	3556	3622	..	3645
26.—Analysis of lighting gas—								
Carbon dioxide . . CO_2 . . per cent.	3·0	2·6	2·2	2·6	2·6	2·6	..	2·6
Hydrocarbons . . C_nH_m . . ,,	3·0	3·0	2·6	3·0	2·8	3·2	..	2·93
Oxygen . . . . O_2 . . ,,	0·4	0·2	0·6	0·4	0·4	0·2	..	0·37
Carbon monoxide . . CO . . ,,	9·2	9·4	9·2	9·0	9·4	8·8	..	9·17
Hydrogen . . . . H_2 . . ,,	52·4	52·4	53·6	53·6	54·0	53·6	..	53·27
Marsh gas . . . . CH_4 . . ,,	28·0	29·2	28·7	28·0	27·6	27·6	..	28·20
Nitrogen . . . . N_2 . . ,,	4·0	3·2	3·1	3·4	3·2	4·0	..	3·48
Specific gravity	0·442	0·429	0·435	0·425	0·424	0·432	..	0·431
27.—Temperature of heating flues . .deg. Fahr.	2194	2282	2287	2374	2354	2338	..	2304
28.— ,, ,, top horizontal flue . ,, ,,	1917	1931	1944	2043	1950	1960	..	1958
29.— ,, ,, waste heat flue . . ,, ,,	455	473	482	482	473	482	..	473
30.— ,, ,, raw gas in gas-main ,, ,,	392–536	392–536	392–536	392–536	392–536	392–536	..	..
31.—Analysis of waste gas . . . . . per cent.	..	19·8 CO_2	18·8 CO_2	19·3 CO_2 0·7-O_2 19·5 CO_2 0·7-O_2	19 CO_2 0·7-O_2 19 CO_2 0·7-O_2	..	..	19 CO_2
32.—Power required for the oven plant. . deg. Fahr.	..	..	..	..	..	..	..	..
33.—Fuel consumption . . . . . ,, ,,	..	..	..	..	..	..	..	..
34.—Coke for gas producers, including water and ash (coke breeze I. ½ in. to 1 in. in size) . tons	27·37	27·150	25·960	27·060	28·840	28·06	164·44	..
35.—Coke for gas producers, including water and ash (coke breeze II. dust to ½ in. in size). tons	2·090	2·130	3·790	2·820	2·050	1·070	13·95	..
36.—Analysis of coke for gas producers (coke breeze I. ½ in to 1 inch)—								
Ash . . . . . per cent.	20·73	16·24	16·77	13·53	15·61	13·94	..	16·14
Water . . . . . ,,	17·02	17·23	16·04	18 31	19·79	19·44	..	17·97
Pure coke . . . . . ,,	62·25	66·53	67·19	68·16	64·60	66·62	..	65·89
37.—Analysis of coke for gas producers (coke breeze II. dust to ½ inch)—								
Ash . . . . . per cent.	20·61	15·24	15·98	14·82	20·71	14·02	..	16·90
Water . . . . . ,,	21·65	19·35	17·62	17·72	17·18	18·50	..	18·67
Pure coke . . . . . ,,	57·74	65·41	66·40	67·46	62·11	62·11	..	64·43
38.—Total quantity of pure coke consumed . tons	18·250	19·460	19·960	20·340	19·910	19·440	117·360	19·56
39.—Total quantity of dry coke with 11·4 per cent. ash . . . . . tons	20·580	21·960	22·530	22·960	22·470	21·940	132·440	22·07
40.—Fuel coke (guarantee-coke) per 1000 cubic feet of gas as per item 16 . . . . . lbs.	20·85	21·52	21·82	22·21	22·82	21·85	..	21·85
41.—Guaranteed . . . . . ,,	..	..	..	..	..	..	..	23·2
42.—Fuel consumption, pure coke in relation to raw coal . . . . . per cent.	9·36	9·89	10·24	10·43	10·21	9·97	..	10·02
43.—Fuel consumption, guarantee-coke in relation to raw coal . . . . . per cent.	10·56	11·26	11·55	11·78	11·52	11·25	..	11·48
44.—Guaranteed . . . . . ,,	..	..	..	..	..	..	..	11·90
45.—Analysis of producer gas—								
Carbon dioxide . . CO_2 . . ,,	2·6 2·2	2·6 2·8	2·6 2·8	3·2 3·6	3·2 2·4	2·4 2·4	..	2·73
Oxygen . . . . O_2 . . ,,	0·0 0·0	0·0 0·0	0·2 0·0	0·0 0·2	0·0 0·2	0·2 0·0	..	0·07
Carbon monoxide . . CO . . ,,	28·8 27·4	29·6 29·4	29·2 28·2	28·0 26·6	27·6 27·6	28·8 27·8	..	28·25
Hydrogen . . . . H_2 . . ,,	9·2 9·0	6·8 7·0	7·2 8·0	7·2 8·8	7·6 8·8	8·8 8·8	..	8·10
Nitrogen . . . . N_2 . . ,,	59·4 61·4	61·0 60·8	60·8 61·0	61·6 60·8	61·6 61·0	59·8 61·0	..	60·85
46.—Calculated calorific value of producer gas, lower value. . . . . B.Th.U.	4444 4254	4297 4293	4289 4250	4143 3960	4134 4258	4404 4283	..	4250
47.—Producer gas calculated from analysis mill. cb. ft.	3·76	3·83	4·01	4·20	4·09	3·98	23·87	..
48.—Producer gas from 1 lb. of pure coke . ,,	92·1	87·92	89·86	92·34	91·73	91·58	..	90·92
49.—Slag from producers . . . . . tons	3·88	4·52	3·69	3·28	6·310	3·55	..	4·2
50.—Amount of coke left in the slag in per cent. of amount of coke charged into producers . per ct.	2·22	1·29	1·78	1·32	2·63	2·07	..	1·885
51.—Heat required to carbonize 1 lb. of raw coal B.Th.U.	1062	1067	1112	1105	1112	1123	..	1097
52.— ,, ,, ,, ,, 1 lb. of pure coal B.Th.U.	1193	1186	1260	1235	1260	1287	..	1237
53.—Dust in 1000 cubic feet of producer gas grains.	4·37	21·41	9·61	11·36	2·62	8·74	..	9·68
54.—Labour cost per 1000 cub. ft. of gas produced .	·41d.	·399d.	·392d.	·392d.	·412d.	·404d.	..	·401d.
55.—Guaranteed labour cost per 1000 cub. ft. of gas	..	..	..	..	..	..	..	·473d.
56.—Cost of labour per ton of raw coal carbonized	4·91d.	4·94d.	4·96d.	4·97d.	4·93d.	4·89d.	..	4·93d.
57.—Guaranteed labour cost per ton of raw coal carbonized	..	..	..	..	..	..	..	5·34d.

removed. Around each producer is a water-jacket; and by the heat evolved in the producer the water is turned into low-pressure steam. Sufficient steam is thereby obtained to drive the machinery necessary on the plant for turning the grates, suction fans, &c., and still leaves a small surplus. It is used in an 80 H.P. horizontal steam-engine. In the producer house there is a carbonic acid recording instrument by which the gas is tested continuously. Three men only are employed on this part of the plant. This method of heating the ovens works very satisfactorily indeed; uniform heating being attained throughout the charge, and no trouble in working has been experienced during the past two years.

With regard to the method of heating the ovens, this is carried out on Koppers' regenerative principle; and it is to this feature that the installation owes much of its economic success. The regenerative system differs from the recuperative system in one important respect. In the latter, the waste heat—or hot waste gases—and the air to be preheated are on opposite sides of a wall, and the heat has to be conducted through the wall. If the wall is thick so as to ensure no leakage, then conductivity suffers; while, conversely, if the wall is made thin so as to increase conductivity, then leakage increases also. In the Koppers' regenerative system, the disadvantage due to bad conductivity and leakage are done away with by the adoption of the reversal system. For half an hour the hot waste gases heat up the chequer brickwork in the first regenerator chamber. During the next half hour, the waste gases pass through a second regenerator, while the air and producer gas pass through the first preheated regenerator and are in direct contact with the hot brickwork. Hence the heating of the gas and air is more satisfactory, and no contamination by waste gases is possible.

The gas from the producer plant is well washed with water before use; otherwise coke dust may be carried forward into the supply pipes and heating flues, and when burnt it would form a slag with the material of the brickwork and so affect the life of the chambers. The pipes for air and gas supply are arranged along the bottom of the setting; the regenerators being arranged alternately for air and gas. Both gas and air are treated exactly

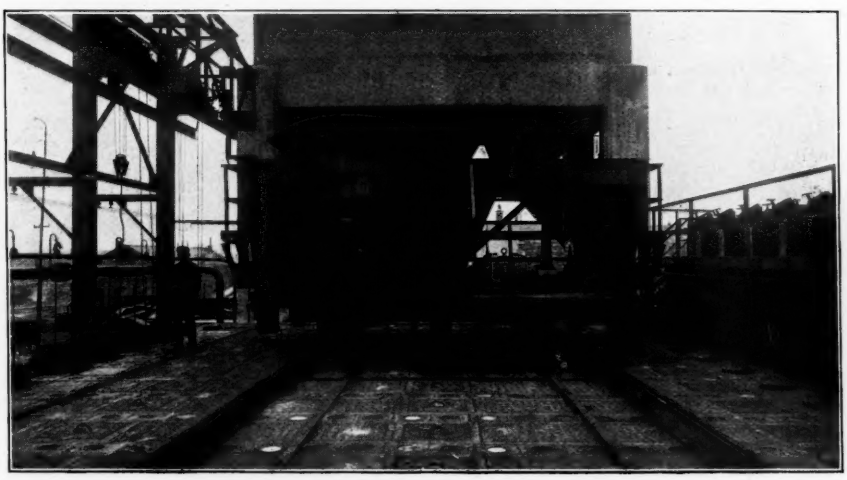


Fig. 5.—The Charging Waggon Underneath the Coal-Hopper.

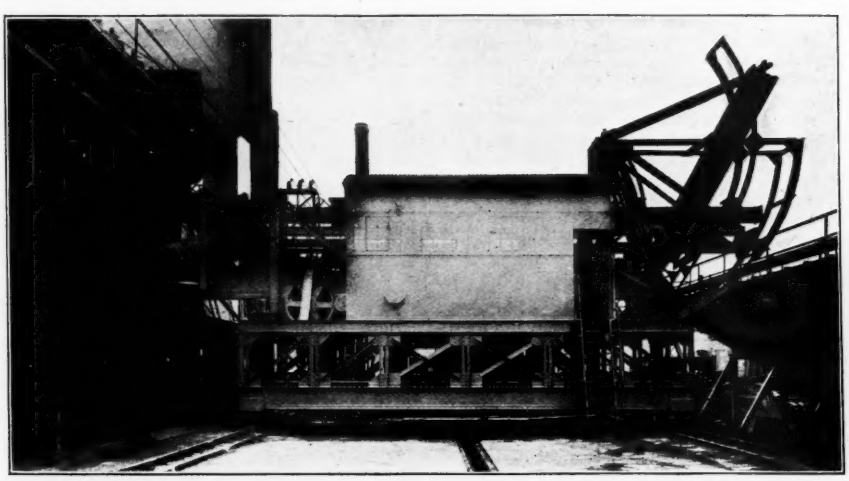


Fig. 6.—The Combined Pushing Engine and Levelling Machine.

alike, and this naturally simplifies the whole working. They enter through their respective pipes, and are preheated by passing through the regenerators.

The gas then burns in the flues at the level of the oven floor. The gases of combustion, after passing through the heating flues, enter the other series of regenerator chambers, and when the half-hourly reversal is made, the heat absorbed by the chequer brickwork in the regenerators is used to heat up more gas and air. The interchange of the hot waste gases with the producer gas and air supplies is an operation involving only the turning of a wheel which is connected with a cable running along the whole length of the battery; and this cable operates the reversing arrangements for all the ovens at once. The arrangement of the supply pipes and cable, &c., is shown in the photograph (fig. 3). The two open pipes admit air and the others gas from the main above.

The calorific value of the producer gas is about 1070 calories. One part of producer gas requires one part of air for combustion; and here, again, the simple equivalence of the two gases simplifies the working. The gas is purified from sulphuretted hydrogen by means of oxide of iron, and there is full revivification *in situ*. As there is no illuminating standard, and the presence of a little air does not affect the calorific value to a large extent, the same concern with regard to the admixture of air is not felt as is the case in England. Up to the present time no trouble at all has been experienced with naphthalene.

With regard to the cost of the production of the gas in this installation, full official working tests have been made and a report issued. A summary of the results obtained is appended; and it will be seen that highly satisfactory results are yielded.

Regarding the plant as a whole, the writer is firmly convinced of its sterling worth and its satisfactory work in every way. Both gas and coke yields are exceptionally good, and after several days careful observation of all working details and results the writer is much impressed with the installation. Indeed, his belief is that a few years' time will see great extensions in the direction of chamber carbonization carried out by the regenerative system. It is interesting to note that since the erection of the first battery at Vienna, Koppers have received orders for further large installations at Buda-Pesth, Kiel, Birmingham, Berlin, and Tokio.

THOUGHTS—AFTER MANCHESTER.

By R. W. E.

Those who had the privilege of being present at the recent meetings of the British Commercial Gas Association cannot but feel that there was much for after-thought. The enthusiasm, good feeling, and loyal co-operation, crowned by a prince of Presidents, certainly left nothing for even the most fastidious to complain of. Again, the papers were excellent. That which was presented first embodied many points worthy of consideration. It brought home the possible future value of the Association, whose edifice has been erected on the foundations of co-partnership, consisting of gas manufacturers and gas apparatus manufacturers. This co-partnership would have been considered somewhat impossible a few years ago, owing to the wide gulf that then separated the two parties; whereas to-day the partnership is looked upon as a *sine quâ non* to the success of the Association and the furthering of sales of gas. It is therefore sincerely hoped that those municipal and company gas undertakings who have not yet fallen into step, and joined the Association, will immediately do so, and thus complete the support from the gas manufacturers' side.

One then ponders over the question of the disposal of gas profits, and the comparison with our partners respecting the disposal of theirs. Municipal administrators had no second thought in the days gone by but that any surplus from the gas undertaking should go to the relief of the rates; and at one time—when gas was unchallenged by a competitor, and ratepayers and gas consumers were synonymous—there was really no objection to this. But with the advent of electricity, circumstances are much altered. Now any surplus from a municipal gas undertaking if handed over to the rates is *ipso facto* a relief to our competitor where, in many instances, it cannot make both ends meet. Therefore it is quite a sound proposition that any surplus from a municipal gas undertaking should be applied only to the reduction in the price of gas.

The position with gas companies is not quite dissimilar. A principle was originally laid down by Parliament that the surplus profits should go to the gas consumers. The first arrangement of maximum dividends of 10 per cent., and after paying this and providing for reserve funds the surplus (if any) was to be handed over to the consumers in the shape of a reduction in the price of gas, was subsequently followed by the sliding-scale; the object being that the consumer gave up his claim under legislation to the whole of the surplus, and took instead a portion—giving up to the company a part (to enable the shareholders to receive an increased dividend) as an inducement to better management and cheaper gas. Then, further, the old privilege of allotment of new capital rateably at par, and the acceptance of the auction clauses, was a set-off to the consumer's sacrifice, and rendered the bargain equal and complete in its aims at co-partnership. It is obvious that the best-managed company, under these conditions, would (*a*) encourage economical and efficient working, consequently yield a better profit, and so tend to reduce the price of gas; (*b*) facilitate a higher dividend being paid, and consequently raise new capital cheaper; (*c*) the combination would bring about a result to the mutual advantage of both parties.

Later, we have a third partner, in the shape of the worker, who renders efficient, willing, and loyal service—thus assisting all the aforementioned factors. For this, he participates in the surplus to the extent of ½ to 1 per cent. on his wages for the year per penny that gas is sold below a standard.

Thus on the gas manufacturers' side we have a complete arrangement of co-partnership, whether municipal or company. The prices of gas are graded, profits are limited, and the channel for the disposal of surplus profits defined.

Let us look at our British Commercial Gas Association partners. What are their arrangements? They are not limited in their districts, and are able to sell their commodities all over Great Britain and abroad. The charges are unlimited, and only governed where real competition exists. Their profits are also unlimited, and can be disposed of at will to the shareholders. The shareholders not only can obtain high dividends, but have their shares allotted at par.

The substance of my point is that our Association has been formed under excellent auspices—blessed by those in high places; but I fear (owing to the period of incubation being short, as stated by the President) there may have been some salient points overlooked, and I mention them now with all good-will.

I believe that the two principal partners in the Association should participate equally in benefits (as they do) and liabilities. I am firmly convinced that both parties must contribute equally or not at all. I believe that the gas manufacturers will, on their part, at an early date raise their contributions to £15,000 per annum; and I submit that it will appear somewhat unequal that one partner should do this and the other, who shares equally in benefits, only contribute about 15 per cent. I could readily submit further, and equally convincing, arguments in support of this point; but I think sufficient has now been said to introduce it for the consideration of the Committee and the subscribers generally. Furthermore, I feel sure that the gas apparatus manufacturers will speedily take steps to adjust this matter.

In conclusion, I would suggest that the Association should provide, as may be required, (*a*) expert canvassers, (*b*) lecturers to the public and employees, (*c*) laboratories, not only for research work in respect to gas apparatus, but for testing other commodities. Canvassers should be classified to take up special branches, one of which was outlined in the magnificent paper read by Mr. Creasey. The lecturers should deliver sound, reasoned addresses to the public, at different times of the year, backed up by demonstrations in keeping with the needs of the community; also to employees, from an educational and special point peculiarly adapted to their duties and responsibilities to the public. The laboratories should be fully equipped and controlled by efficient chemists, to follow up the research work and other points, as outlined in the paper by Mr. Yates, and, further, to act as a consulting laboratory for testing coal, residuals, oxide, and so forth. Of course, the gas undertakings would pay for all these facilities suitable fees outside their annual contributions.

I submit that the Association is in its infancy, and that too much discussion cannot take place from time to time, from which the Committee can draw such food for reflection as will assist them in building-up the Association to such a position as will make it indispensable to all in our industry.

STARTING-UP RETORT-SETTINGS.

By "Almea."

To a very large extent, the future welfare and life of a retort-bench depend upon the manner in which it is treated when the bricklayers have left and it is ready for "active-service." In this respect, the present-day high heats have not made the task of "warming-up" any easier; and the responsibility of raising the temperature of the combustion chamber (for instance) through a range of 2000° to 2400° Fahr., cannot be taken lightly.

The moisture from "green" brickwork must be expelled as gradually as possible; and, with regard to expansion, it is hardly necessary to state that this must be allowed to take place slowly if cracks and opening joints are to be avoided. This is particularly the case with some of the modern forms of settings, many of which have elaborate devices for bringing about the regeneration of the secondary air.

With regard to starting-up retort-settings, not only has one to guard against the danger of cracked and broken work, but more serious cause for alarm arises from the possibility of explosions, with their consequent injury to the setting and to individuals who may be in the vicinity.

New Work.

With new brickwork it is usual to run slow fires for at least five weeks. At the end of this time, the settings may be put on to a medium fire for about three days, and on to the full working fire (*i.e.*, "fast fires") for another two or three days before the coal is put into the retorts. With regard to the actual method of working the various fires and the manipulation of the many dampers, the following points will be of interest, and are generally followed in the process of heating-up settings of the larger types.

Firstly, when the fire is put in, the retort doors on the bench should be closed; but the levers must be left slack, in order that the expanded air may escape. If the retorts are completely sealed, it means that considerable pressure is thrown upon all the apparatus up to the setting valve (usually near the outlet of the hydraulic main), with the probability that an exit will be forced in some spot which will cause trouble when the retort is charged with coal.

For "slow fires," the amount of primary air required is quite small, and will in most cases be about one-tenth of the quantity required when the setting is on full work. It is also usual to open the secondary air slides to only a very small extent. During this period the main dampers—*i.e.*, the dampers separating the settings from the main flue and shaft—should be kept closed, so that the heat is circulating in the setting alone; and to provide an exit for the waste gases a brick may be removed from the upper part of the front wall of the setting. In addition, the lid is, of course, removed from the furnace charging-door.

While "slow fires" are on, it will be found that very little clinkering is necessary, and it is usually quite sufficient if the fires are attended to once each week. The ash-pan should be filled up with water, and the water supply may then be adjusted so that there is a mere trickle playing on the fire-bars.

When the settings have been on "slow fires" for a sufficiently long time, it is advisable to put them on to a medium fire for a few days. To do this, the bricks removed from the front walls should be replaced and the lid put on the producer charging door. Great care, however, is necessary in order to see that the furnace arch is hot before the charging door is sealed; otherwise, explosions may follow. The main dampers should now be opened to their full extent for a few hours so as to allow the hot gases to get through to the main flues and shaft until the latter are heated sufficiently to create a draught. The dampers may then be closed down to about one-quarter of the full working amount, and are left in this position until the "fast fires" are put on.

When the "fast fires" are started, the dampers and air-slides are, of course, opened to the maximum amount required for working the setting. If it is necessary to re-start benches which have been in use before, it is generally quite sufficient if "slow" fires

are put in about a week or ten days prior to the time when the settings are required. The "fast fires" should then be kept up for three days; the manipulation of the air-slides, &c., being precisely the same as that described for the new work.

In those works in which a regular practice is made of shutting-down every Sunday, the main dampers and air-slides have to be adjusted to suit the requirements of the day. On many works it is usual to cease work from 6 a.m. to 6 p.m., in which case the main dampers must be closed at 6 a.m. to about three-quarters of the usual amount and the primary and secondary slides to one-half. The dampers and slots would then be opened to their working amounts at about 3 p.m., in order to get up the heats to the desired pitch, ready for the charge of coal which would be going in at 6 p.m.

Explosions in Settings.

Explosions in the settings are particularly to be guarded against; for more harm may be done by these than by raising the heat of the setting too rapidly. As regards their occurrence, they are usually caused by filling up the furnace with too much cold coke at a time, by filling up with wet coke, or by putting the lid on the charging-hole before the furnace is sufficiently hot.

What usually takes place is that the primary air pulled in through the shallow bed of coke is partially converted into carbonic oxide; while a part of it travels through the coke unchanged, and, therefore, furnishes a supply of oxygen. The result is that the furnace and the whole of the setting are filled with an explosive mixture, the temperature for the time being insufficient to cause explosion. The lid is now put on, with the result that the temperature rises until it is sufficiently high to bring about the combustion of the carbonic oxide and oxygen. The force of the explosion depends, of course, upon the quantity of these gases which are circulating in the setting at the time.

The only reliable way of judging whether or not an explosion will take place if the charging-hole is closed is to be sure that the furnace arch is red-hot, or to see the gas actually burning in the nostril-holes. If this is the case, any carbon monoxide or ogygen which may be passing through the furnace will be burned at the furnace arch before finding its way into the setting. The writer has in mind the case of one explosion which took place when the combustible gases had passed through the setting and into the regenerator. The lid was put on the furnace by a man new to his work, and a few moments later every plug in the setting was blown, with considerable violence, right across the retort-house subway, narrowly missing some men who were at work on the adjacent setting.

Wet coke should always be avoided as far as possible when the furnaces require recharging; for this, lying in a dead layer on top of the red-hot fuel, permits the passage of the carbonic oxide and oxygen, but chokes and subdues the actual flames. The result is that the furnace and setting are filled with the gas, and, after a time, when the heat of the fuel picks up, the flames will break through the hitherto dead layer of coke and ignite the gas.

The same argument applies to the practice of filling up the furnace with a large quantity of cold coke at a time. If the coke is hot, and has just been taken from a working retort, there is no reason why the furnace should not be completely filled if so desired.

PIPING A HOUSE FOR GAS.

By Henry O'Connor, Assoc.M.Inst.C.E., F.R.S.Ed.

The first thing is to decide upon the positions for the various burners and whether brackets or pendants are to be used. The positions, &c., are usually decided by the architect or owner of the premises; so that all the gas-fitter has to do is to arrange for the piping of the necessary size, and for carrying it in the most economical way from the meter to the various burners.

First, then, a drip should be placed as near as possible to the meter, and all pipes carried so that any moisture deposited will run back to this drip and not enter the meter. Then all brackets should be supplied from below, so that any dirt or condensation is carried away from the bracket, as if dirt or water gets into a bracket it is very difficult to remove. Pendants should have their supply taken from the top of the pipe, so that any liquid running along the pipe does not fall into, and perhaps block up, the gas-way of the pendant.

The position and direction of the joists is one of the most important items, and should have first consideration, as these joists must only be cut near the supports, and never in the middle. A large part of the joist may be cut away near its bearings without any weakening of it; but at the middle of it the slightest cut reduces its strength. Carry compo. pipe on strips of wood nailed along the side of the joists, so that no sag shall afterwards occur. Fasten all boards where carried over gas-pipes with brass screws, greased before using, and preferably use brass countersinks in the wood. This is to allow of the easy removal of the board when required. Where iron pipes are used, connectors, or "long-screws," should be freely employed, so that any portion of the piping can be disconnected when a new connection has to be made. Use separate supply pipes to gas-cookers, or gas-pipes direct from the meter, in order to ensure that there shall not be a drop in the lights when the stove is lighted up.

When deciding upon the size of pipes to be used, in moderate sized houses, the following method of computing them may be used. Measure each size of pipe in eighths of an inch and square the number. Then a

¼ inch pipe = 4	¾ inch pipe = 36
⅜ ,, ,, = 9	1 ,, ,, = 64
½ ,, ,, = 16	1¼ ,, ,, = 100
⅝ ,, ,, = 25	1½ ,, ,, = 144
	2 ,, ,, = 256

Then for each bracket allow 3, or for each pendant 9, up to a 3-light or 15 if a 5-light. If we have decided upon the best direction to carry our pipes, we begin at the end; and if three brackets (equals 9) are to be supplied, we use a ⅜ inch pipe (equals 9). We then (say) meet a supply to a 3-light pendant (equals 9) on the floor below; and thus our total now reaches 18—rather more than a ½ inch pipe will carry. We, therefore, use a ⅝-inch pipe; and this will serve for two more brackets if we desire to supply them. Perhaps further on we meet a branch pipe having several brackets upon it. We again commence at the end of that branch, and follow its pipe until we reach the junction, counting up the brackets as 3 and the pendants as 9 or 15. We then add the totals of the two together and proceed as before until the meter is reached, each branch in its turn being counted up from its end and added to the total of the connecting-pipe. By this means, we make our pipes exactly proportioned to the work they have to do, and by a simple method that ensures accuracy without troublesome calculations.

The above arrangements would be very simple and could be easily carried in the head by any gas man. We have, however, to take into consideration the length of the different sized pipes which may be used. The new regulations for house piping in New York give a list of diameters of pipes of different size and the maximum length that may be used, as well as the number of burners to be supplied by each size of pipe. These follow very closely the dimensions fixed by the Manchester District Institution of Gas Engineers; and in comparing these figures, a large number of calculations have been made by the writer to obtain a list of the quantities of gas to be supplied by each pipe and the length in feet which will keep the loss of pressure fairly constant. In this list, allowance has been made for the extra friction of the small pipes which was shown by the tests made by Mr. Chandler, and was commented upon by the writer in the "Journal" for April 9, p. 105; and the length of the pipe from ¾-inch downwards has been increased, when making the calculation, so as to correct for this extra friction.

The table below shows the number of cubic feet and the length of pipe suggested by the writer and length of same in the New York regulations. It has been thought best to put these figures in cubic feet in preference to burners; but if the burner is desired an allowance of 5 cubic feet per burner may be made, so that the figures shown in the column "cubic feet," if divided by 5, will indicate the number of burners.

Diameter.	Areas.	Cubic Feet.	Length.	New York.	
				Cubic Feet.	Length.
Inches.			Feet.		Feet.
2	3·142	800	200	1000	200
1½	1·767	450	150	500	150
1¼	1·227	350	100	300	110
1	·7854	225	80	175	80
¾	·442	100	60	100	60
⅝	·307	75	40	—	—
½	·196	50	30	30	36
⅜	·110	25	20	15	26
¼	·049	15	6	—	—

Thorium and its Compounds.—Under the auspices of the Institute of Chemistry of Great Britain and Ireland, a lecture on this subject will be given by Mr. Edmund White, B.Sc., F.I.C., on Friday, the 1st prox., in the Chemical Lecture Theatre of the Finsbury Technical College, Leonard Street, City Road, E.C. In the course of his lecture, Mr. White will deal with the yield and relation of thorium to the cost of extraction, the uses of thorium compounds, and the testing of thorium nitrate for commercial purposes.

Coal Production in America.—A chart issued by the United States Geological Survey furnishes a striking statistical history of the progress made by the coal trade. It shows that in 1814 the total amount of coal produced in the United States was 22 short tons, all of it anthracite; the next year 50 tons were mined; then 75 tons; and in 1819 the total quantity was 350 tons. There was a remarkable increase, however, in 1820, when 3450 tons were mined; and two years later the quantity was 58,583 tons, due to the opening up of the Virginian bituminous coalfield, with an output of 54,000 tons. From that time coal-mining increased by leaps and bounds, so that at the close of the first fifty years of the industry the output was 23,605,123 tons; and by 1900 it had increased to 269,684,027 tons. The largest annual output so far recorded was that for 1910, which was 501,596,378 tons. In 1911, the total coal production was 496,221,168 tons. The amount of bituminous coal produced by American mines since the beginning of the industry is 6,468,773,690 tons; and the total production of anthracite and bituminous coal is estimated to have been 8,739,572,427 tons.

HIGH-PRESSURE GAS LIGHTING IN GERMANY AND AMERICA.

Under the heading of "A Symposium on High-Pressure Gas Lighting, in Three Parts," the "American Gaslight Journal" for the 7th inst. published the paper presented by Mr. F. W. Goodenough to the Sixth Convention of the Illuminating Engineering Society of America, and, in conjunction with it, two communications on the subject by Mr. Oscar Klatte and Mr. R. N. Zeek, dealing with high-pressure gas lighting in Germany and America. Mr. Goodenough's paper was given in the "JOURNAL" for the 1st inst. (p. 37); and we complete the "symposium" by reproducing the two contributions just mentioned.

HIGH-PRESSURE GAS LIGHTING IN GERMANY.

By OSCAR KLATTE.

Remarkable development in high candle power gas lighting, both by means of gas under high pressure (about 2 lbs.) and by the use of gas at ordinary distribution pressures and air under high pressure (about ½ lb.), has taken place in Germany during the past ten years; so that in nearly all the leading cities one or the other of these systems is in vogue. These systems are used for lighting the principal thoroughfares and squares or parks; and many ingenious methods for lowering the lamps for trimming have been devised.

Many of the streets are lined with trees, so that, to obtain the best illumination results, it has been necessary to hang the lamps over the centre of the street. This has been accomplished both by the use of a pole with long projecting arm and by a wire suspension device, the wire being attached to the poles on opposite sides of the street.

Where the pole with the arm has been used, the latter is made with a double-swing joint, so the lamp may be lowered to a convenient point for trimming. Where wire suspension is used, a travelling block is installed, so that the suspension-hook may be hauled to the side of the street and the lamp lowered so as not to interfere with traffic. Where this method of suspension is employed, the gas or air connection is made through a flexible tube. The lamps used have one, three, four, or five mantles, and vary in candle power from 500 to 4000.

An indication of the growth of this form of lighting is found in the city of Berlin. Up to 1905, about 15 miles of street were lighted with electric arc lamps, and from 1905 to 1911 one mile of electric lighting was added. In 1905, about 4 miles were lighted with high-pressure gas; but during the period from 1905 to 1911, 32 miles of high-pressure gas lighting were added, and a further extension of 42 miles is contemplated.

While high-pressure gas lighting is more or less commonly seen in various parts of the world for street lighting, in Germany it is employed, not only for lighting streets, but also for lighting freight stations, amusement parks, and similarly enclosed or semi-enclosed spaces where high candle power units are suitable; and the use of this method of lighting with single-mantle units and indirect fixtures is being developed for the illumination of drafting-rooms and schools. Indications point to a greatly increased development of this method of lighting for all purposes.

HIGH-PRESSURE GAS LIGHTING IN AMERICA.

By R. N. ZEEK.

High-pressure gas lighting in America has not reached the same state of development that it has in either England or Germany. This undoubtedly has been due to the fact that pressure gas lighting has never been pushed as a commercial possibility. However, with the number of installations now being operated successfully, there is every reason to suppose that this form of lighting will take its place among the more common ones. I shall attempt to confine this paper only to a description of each of the six installations at my command. . . . The installations I propose to describe are in Philadelphia, Waterbury, Wilmington, Washington, Des Moines, and Chicago.

The installation in Philadelphia consists of seven two-arm ornamental posts, equipped with fourteen two-mantle lamps, located round the United Gas Improvement Company's building. The ordinary pressure in a gas-mantle fed from the mains is about 1·5 oz.; but in the system under consideration this pressure is increased by a blower to 2 lbs. The gas comes from a street main through a special service, passes through the meter, and then through an anti-fluctuator placed in the line to prevent any possible fluctuations from the compressor being noticed in the service. From the blower the gas goes to a storage-tank, through a relief-valve so adjusted that when the pressure is in excess of 5 lbs. the gas is bye-passed through the relief-valve and the inlet to the governor. The storage-tank in this case is a 100-gallon hot-water boiler, and its great capacity prevents any fluctuation being communicated to the governor. From the tank the gas is conducted through a governor weighted to throw an outlet pressure of 2¼ lbs., thereby ensuring 2 lbs. at the lamp. The blower or compressor is, in this case, directly connected to a specially wound motor; but there is no reason why the compressor could not be run by a belt to either an electric or water motor, or a gas-engine. In some of the installations, gas-engines are used to drive the compressor, and are so located that they can be used for demonstration purposes.

A separate line of piping was run to supply the pilot-lights of the lamps. The pilot is controlled from a point in the basement, and the compressing plant has a valve, arranged with a lever, which may be set in three positions. The first is the position of the cock when the lamps are burning and the pilot gas is entirely off; the second is with the valve about half-way open, which is the position during the day or when the lamps are extinguished and the third is when the valve is entirely open, giving a long jet, or practically a flash-pilot, which is used only for a short time when the lamps are being lighted from the pilot, or when the pilot in turn is being lighted from the lamps. The entire compressing plant is installed in duplicate as an emergency precaution.

A few figures on the illumination obtained from these lamps will be of interest. The two lamps on each post are hung 16 ft. 6 in. above the pavement, while the posts are spaced 35 ft. 6 in. from centre to centre. Considering the plane of illumination 3 feet above the pavement, the average illumination was 3 foot-candles. These readings were taken within a radius of 15 feet from the base of the post; and, strange to say, all the readings were very uniform. This was undoubtedly due to the fact that the smallest possible incandescent surface was exposed to the disc of the illuminometer directly below the mantle, where the distance was the least. The shape of the light-distribution curve from the lamp bears out this argument. It indicated that the lamps were peculiarly well adapted to street lighting, since directly below the lamps the candle power is 480, while at 65° it is 920.

In Waterbury, the case is an entirely different one. Seven single-mantle lamps are installed on as many posts at the approach to the railway station. A high-pressure main supplying an outlying district passes through the locality; and this fact made the installation of high-pressure lamps a very economical and easy one. The pressure on the main line supplying these posts varies from 10 to 20 lbs. per square inch during the 24-hour day. This is reduced by means of a small governor, 3·5 inches diameter, located on the line in the base of each post, to 2 lbs., which is the pressure best adapted to this particular lamp. The lamp is operated by means of a pilot-light supplied through the main cock at the lamp, which cuts off the pilot during the lighting hours. The lamp-cocks are worked by a lever with a light rod attached, extending down the post to within 8 or 10 feet of the ground, for convenience in lighting and extinguishing.

The installation at Wilmington is similar to the one in operation in Philadelphia. There are four single-mantle lamps installed on posts in front of the Gas Company's building. The pressure is obtained by means of a compressing plant in the basement of the building; and the lamps are operated and controlled in much the same way as in Philadelphia.

The installation in Washington consists of six two-mantle lamps installed on three posts in front of the Gas Company's general offices, and four single-mantle lamps installed on two posts in front of the sales department offices. The pressure is obtained by a compressor in the basement; and the operation of the lamps and pilots is similar to that described above in the case of Philadelphia.

Des Moines has six single-burner high-pressure lamps installed on three ornamental curb posts. The pressure is obtained from a compressing plant in the cellar, operated by a 2·5 H.P. gas-engine, which serves the double purpose of being an exhibit for the sale of gas-engines as well as furnishing the power for the compressor. The method of operating the lamps and pilots is identical with those previously described.

The Chicago installation consists of forty single-mantle lamps, installed on brackets between the columns of the People's Gaslight and Coke Company's building. The lamps are operated on gas boosted to 2 lbs. pressure; and to secure the increase there has been installed in the sub-basement a duplicate booster set, consisting of two 4 H.P. motors direct connected to two blowers. They are so connected as to eliminate the possibility of allowing the pressure to drop back to that of the city, inasmuch as the motors are connected to a specially constructed panel-board arranged so that if one machine stops, the other is automatically thrown in and takes up the load. The boosters will give a pressure of 5 lbs. per square inch; but the gas is not delivered to the lamps at this pressure. A specially constructed governing bye-pass is used, which sends the excessive quantity of gas back again through the booster.

There are other systems on the market. One especially, in which the air is delivered to the lamp under pressure (about 2 inches of water), is extensively used; but, of course, in this case another pipe to each lamp is required. In these instances, the efficiency will be practically the same as with the high-pressure lamps.

Since high-pressure gas lighting has passed the experimental stage, and for a number of years has been so successfully operated in America, there is every reason to suppose that in the near future this form of lighting will be as prominent as either low-pressure gas or electricity is to-day.

Society of British Gas Industries.—We learn from the Secretary (Mr. Arthur L. Griffith) that the autumn general meeting of the Society will be held at the Trocadero, Shaftesbury Avenue, on Wednesday, the 20th prox.

SCOTTISH JUNIOR GAS ASSOCIATION.

EASTERN DISTRICT.

Opening of the New Session.

The Opening Meeting of the session of the Eastern District Division of the Scottish Junior Gas Association was held in the Heriot-Watt College, Edinburgh, on Saturday. Mr. J. R. MOYES, the retiring President, presided; and there was a good attendance of members.

The minutes of the previous and the Council meetings having been adopted,

Mr. MOYES, in opening the proceedings, said it gave him great pleasure to see so large a number of members present. He expressed the hope that the session they were entering upon would be as successful as any of its predecessors, and that the meetings throughout the year would be well attended. Every advantage ought to be taken of the various means placed at their disposal for gaining knowledge; and their motto should ever be: "Let there be light." Light was the thing at the present time. They were devoting all their energies towards getting better light and ensuring smoke abatement; and he trusted the members would try to learn all they could on these points. He would like to express his gratitude to Principal Laurie and the various firms who had so kindly placed their works at the disposal of the Association during the session. They were all very much indebted to them; and he hoped that during the coming session a large number of members would take every advantage of the facilities offered. Mr. Moyes concluded by calling on Mr. Alexander Bishop, of Newtongrange, to take the position of President of the Association. He said it was not necessary to say anything in commendation of Mr. Bishop, as he was well known to them; and he (the speaker) was sure he would occupy the chair with credit to himself and to the Association. (Cheers.)

THANKS TO THE PAST-PRESIDENT.

Mr. BISHOP then took the chair, and, in accordance with custom, presented to Mr. Moyes, in the name of the Association, a gold medal as a souvenir of his term of office. He asked the members to accord thanks to Mr. Moyes for the manner in which he had discharged the duties as President.

The members cordially acquiesced.

Mr. MOYES, in reply, thanked the members for the honour they had conferred upon him. He said, although he had quitted the chair, he would always take a great interest in the Association. He had now been nine years in office, and he thought it was time to give some of those who had kept in the background an opportunity of coming forward and letting their light shine.

PRESIDENT'S ADDRESS.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

In taking the chair on this occasion, I cannot allow the opportunity to pass without cordially thanking you for the high honour you have conferred upon me in electing me your President. I appreciate the honour more highly than I can express; and while I am conscious of my inability to competently discharge all the important duties which necessarily devolve upon me, I shall perform them to the best of my ability, and confidently rely on your generous sympathy and co-operation for the rest. With such assistance, I feel sure this session will not be less successful than those which have preceded it.

DISTRIBUTION MATTERS.

The difficulty of selecting suitable subject-matter is one in which it is no easy matter, in the preparation of a Presidential Address, to avoid ground which has not been previously traversed, and to impart some degree of interest. In addressing you to-day, I purpose confining myself with some reference to the distribution and utilization of gas, which are to-day more important than at any previous period of the history of gas. The low pressures which existed in the mains until a few years ago no doubt held good with flat-flame lighting; but with the passing of the flat-flame burner, these must be relegated to the past. The tendency now is to raise pressures all round, in order to meet the needs of modern lighting, cooking, and heating appliances; also because of the mains not being of sufficient capacity to provide an adequate supply in the town or outlying districts owing to the heavy consumption during the maximum lighting hours, with the result that the pipes become too small by the increased and increasing demand for gas. It, therefore, becomes the duty of the gas engineer to consider how these difficulties are to be overcome, and how the consumers in the town and outlying districts are to be provided with an adequate supply of gas at a pressure which is necessary to obtain the best results from the various appliances which are in use.

ENLARGED MAINS *v.* BOOSTING.

The extra pressure required is usually not more than a few inches of water pressure. The question, therefore, is whether, for such a small increase of pressure, it is economically better to enlarge the main pipes at a great cost, or instal a simple booster or compressor at the gas-works and have at command a means of increasing pressure in excess of any likely requirements. In this matter, thought and consideration must be given to local conditions, as to what extent and form the boosting plant or high-pressure transmission shall take. I think the system commends itself to the following conditions:—

1.—Raising pressure in the distribution mains in the district.
2.—Where it is required to couple-up gas-works whose areas of supply adjoin; making one manufacturing and one distribution station, respectively.
3.—For sending a supply of gas to outlying villages or district gasholders.

The forms of high-pressure system to meet these conditions may be:—

1.—A high-pressure pipe line connected up with the old low-pressure main at frequent intervals; each connection being controlled by a suitable governor.
2.—A high-pressure distribution main direct to the compressor, bringing a return pressure pipe from a given point in the system back to the compressor, where it actuates a governor on the engine, and increases or decreases the quantity delivered according to demand, thereby avoiding excessive pumping.

EFFECT OF MODERN ROAD TRAFFIC ON PIPES.

With increased pressures and present-day road traffic conditions, it is imperative that the medium through which the distribution of gas takes place should have more attention than formerly. The main pipes in general use for gas are of cast iron. There is, however, one drawback to cast-iron mains, and that is their liability to fracture, especially in pipes of small diameter. They will not withstand transverse strain, and, consequently, when subjected to loading on a yielding foundation, or in a position where for some reason or other there has been a subsidence of the subsoil, their inability to resist the strain results in fracture.

The present-day conditions of road traffic are against the maintenance in soundness of a rigid and inflexible distributory system. The kind of pipes which were suitable under the condition of comparatively light road traffic until recently can hardly be expected to withstand the different state of things to-day, when we consider the development in the use of steam road-rollers, traction-engines, and the increasing heavy motor traffic along our thoroughfares, and also the vast network of underground conduits necessitated for telephonic and telegraphic communication, sewers, water-mains, &c., in the laying of which the subsoil has necessarily had to be disturbed, and consequently weakened in its power of resistance to the loading strains and vibration inseparable from modern traffic conditions. We are, therefore, impressed with the need for mains to resist the combined effect of loading, vibration, and subsoil subsidence.

STEEL MAINS.

Along with the introduction of increased pressures has come the use of steel mains. The longer lengths in which these pipes are obtainable necessarily implies the employment of fewer joints, and, consequently, a considerable saving in material and labour for jointing, as well as in labour for excavation. The increased carriage and indirect saving of labour in handling the pipes before the actual work of main laying, as well as the unbreakable nature of the pipes, must also be taken into account. Doubt has often been expressed as to the advisability of using steel mains, owing to their supposed greater liability to corrosion, and consequent shortness of life as compared with cast iron. Personally, I think that neither the damp of the ground in which these pipes (protected as they are) may be laid nor the moisture of the atmosphere will attack their surfaces, and they should be quite as serviceable as, if not more so than, cast-iron pipes.

NECESSITY FOR EFFICIENT JOINTS.

Modern road making will eventually demand the attention of gas engineers, as the leakage which occurs in the distribution of gas is in a great measure due to the joints of the main. In roads constructed in the old way—viz., the top metal being rolled and bound in only with mud or road scrapings—the gas, when it escapes, eventually finds its way to the surface of the ground, and is detected easily; the defect being remedied without much difficulty, and at small cost. With pitch grouted materials, tarred macadam, or ordinary macadam the surface of which is waterproofed with some material, it is imperative that the mains should be so laid and jointed that the leakage will be reduced to a minimum, if not stopped altogether. Gas will not find its way out through the surface of roads so made, but will travel in various directions from the point where the main is leaking. Before the leakage is located, a considerable length of the road may have to be opened; and the difference in cost of opening and reinstating a modern road as compared with the old road will make this repair a most expensive matter. Therefore, I think greater attention will have to be given to the method of jointing mains.

In view of the fact that the service-pipes are responsible for a great deal of leakage, it is recognized that, although the initial cost is higher, the truest economy is realized by the use of the heavier water or steam tubes for service-pipes. Lead services have their advantages in that they can be laid with fewer joints. The usual jointing places being with the main and the meter, some care should be given to the making of service connections to mains. The drill should be exactly the correct size to take the tap, and so get a full thread in the main; otherwise we have a bad connection. Although this is hidden at the time, the connection

becomes the cause of much trouble and loss through leakage afterwards.

IMPORTANCE OF METER INSPECTION.

Gas-meters in use are either of the wet or dry description. The regular periodical inspection is a point of the utmost importance, and should never be neglected—more especially the meters of large establishments of every kind where the consumption of gas is heavy, as the results of good carbonization and careful distribution may be easily neutralized by defective measuring appliances on the consumers' premises. During recent years there has been an extraordinary growth of the system of selling gas on the prepayment system.

COMPETITION AND PREJUDICE.

Gas undertakings have had to meet two different kinds of competition at the extremes of the social scale. On the one hand, with the upper classes (to whom economy has been a secondary consideration), the competition of electric light, and, on the other, the competition of cheap lighting oils. In the present competition between gas and electricity gas is still holding its own. No one believes that improvement has reached finality with either of these two lights; and while gas lighting is still to the front, it is our duty to endeavour to keep it there. It is requisite, however, that the superiority be brought to the notice of the public. This is only to be done by a system of education in the true value of the two lights; and though at times it may be a tedious operation, yet with perseverance this higher education will be attended with beneficial results.

Apart from the question of cost, light for light, gas has until recently had to fight against, among other things, prejudice and a natural bias as expressed by makers of rival forms of illuminants. Much has been written and said about the unhygienic part the combustion of gas plays in our every-day life. Wherever human beings are gathered together, there ought, as a matter of course, to be good ventilation. People use up the oxygen and charge the air with deleterious products. With gas lighting, these products are carried up and circulated; with electric lighting they remain stagnant in the room.

VENTILATION AND AIR PURIFICATION.

The question of better ventilation of dwellings, also the purification of the air of the germs which exist in the air which we breathe, will, I think, be taken up by the public health authorities in the near future. There are two methods recognized for the destruction of germs. The first is by means of disinfectants. This is only resorted to in cases where the second method would destroy the material which it is desired to sterilize. The mode held by scientists to be perfect, and to be adopted wherever possible, is sterilization by heat. Therefore, gas, besides its efficiency as a lighting agent and as a ventilator by means of a natural force, is also a purifier of the air.

GAS LIGHTING IMPROVEMENT, &c.

The lighting by gas has undergone great developments since the incandescent system became general. By mechanical and pneumatic appliances we can enjoy the luxury of turning the gas on or off as easily as the electric light. With these appliances, however, it is necessary to have a bye-pass burning, which is a source of waste. I think gas engineers and consumers alike would welcome a mantle which would ignite the gas when turned on—that is, a mantle which would have some sort of igniting material on it, and which would have as long a life as the mantle itself.

GAS FOR HEATING, COOKING, AND POWER.

In view of the improvements in lighting appliances, and the great economy of gas resulting therefrom, we need not be surprised if the returns of some gas undertakings for gas for lighting purposes remain stationary, until the incandescent burner has taken the place of the flat-flame burner. Though this part of the business may not demand much extension of the works, there is fortunately another branch which offers full scope for our attention and energies. During recent years the problem of heating by gas has been the subject of much study and successful experiment; and the manufacture of gas-heating appliances for innumerable purposes has been increasing at a great pace. Not only for manufacturing purposes has gas been found a satisfactory and economical heating agent; but applied to domestic use in the smokeless heating of rooms, heating water, and cooking it is practically without a rival. Gas for power purposes has had to meet competition—for small power, the electric motor, and for large power, producer gas; and while the demand for gas must be great, it is only where low rates are offered that any satisfactory business can be done and retained.

MEETING COMPETITION.

I think the gas industry has never been more impregnable than to-day. Its progress certainly makes the position of every one of its competitors worse. The lowering of the cost of the prime commodity to users is the best form of adding to the armour of the gas industry. The more gas that can be purchased for a given sum the more difficult will it be for electricity to cut into the gas industry's lighting custom to supplement their own. The more heat units that can be supplied for a given sum, the greater the chance the gas industry has for supplementing its own business in domestic and industrial heating of all kinds. The cheaper gas can be supplied for power purposes, the better will it stand in competition with suction-gas plants, oil-engines, and electric motors. Gas has many advantages that cannot be offered by its competitors; but these advantages must be accompanied with a price that can alone compete, in order to occupy a firm stand among its competitors.

The key-note of the present position of the gas industry, which is the subject that interests us to-day, is to be found in the word "activity." Perhaps there was a time when the tendency towards the "rest and be thankful" order of things was a little too pronounced; but nothing of this sort can be laid at its door to-day. As we have been told by different gas authorities that the future of the gas industry is in the hands of the Juniors, it is for us to hold it in its present high position, and even advance it higher. As individuals, each member, however low his position, or however small his responsibility, has it in his power to advance or retard that progress which is essential to its existence. It is for us to see that no effort is spared to thoroughly understand the work we have to perform, to labour constantly to improve our knowledge of the technical principles involved, and to effect all economies and improvements possible to the process for which we are responsible. Therefore, no opportunity should be lost in gaining all the knowledge and experience we can bearing on our present duties.

Mr. W. Geddes (Granton) said he was sure the members had all listened with great pleasure to Mr. Bishop, who had, he thought, shown wisdom in selecting the distribution side of the industry as the subject-matter for his address. Not long ago, it was said that the profits of the gas business were made in the retort-house; but nowadays the saying required some qualification. The commercial side of a gas undertaking had during the past few years become more and more important; and it seemed to him that, in the future, the sales and distribution departments would play a more conspicuous part than they had previously done. He moved a hearty vote of thanks to Mr. Bishop for his address.

The proposition was heartily agreed to.

ADDRESS BY MR. O'CONNOR.

Mr. Henry O'Connor, F.R.S.E., of Edinburgh, then delivered an address on "The Bunsen Burner." It is given below, with his reply to the remarks to which it gave rise.

A vote of thanks was accorded to Mr. O'Connor; and the proceedings closed.

ARRANGEMENTS FOR THE SESSION.

The programme for the session shows that the following arrangements have been made: Nov. 2, visit to the Lothian Coal Company's Newbattle Collieries; Nov. 23, quarterly meeting at Kirkcaldy; Dec. 14, visit to Messrs. Alex. Cross and Sons, Limited, Falkirk; Jan. 11, 1913, visit to Messrs. W. Baird and Co., Limited, Bedlay Colliery Coke-Ovens; Feb. 8, quarterly meeting at Dundee; March 1, visit to the Cowdenbeath Gas-Works, the Fife Mining School, and the Fife and Clackmannon Coal Company's Reserve Station; March 22, joint visit with the Western District to the Coatbridge Gas-Works; April 5, annual general meeting in the Heriot-Watt College, Edinburgh.

THE BUNSEN BURNER.

By Henry O'Connor, F.R.S.E., Assoc.M.Inst.C.E.

[A Lecture delivered before the Scottish Junior Gas Association, Eastern Section.]

When asked to deliver a lecture to-day, I deferred for a while, as I feared I had not the time to undertake the preparation of one which would suit the occasion. It afterwards occurred to me, however, that I might be able to jot down some notes upon the bunsen burner which, if not entirely original, would probably be new to many of you, and would serve to add to your knowledge of that more and more interesting burner invented by Professor Bunsen.

We must first know what the bunsen burner is required for before we can design one which will be specially suitable for its purpose. Is it required merely to produce heat in a form without any light, so that it can play upon cool objects and not deposit carbon? Then we shall require for ordinary coal gas 2·27 parts of air to each part of gas, and the flame will be non-luminous. Of course, this varies according to the gases in use, because for complete combustion

Carbonic oxide	requires	2·38	times its volume of air	
Hydrogen	,,	2·38	,,	,,
CH_4	,,	9·52	,,	,,
Ethylene	,,	14·28	,,	,,
Propylene	,,	21·42	,,	,,
Ethane	,,	16·66	,,	,,
Acetylene	,,	11·90	,,	,,
Benzene	,,	35·70	,,	,,

This refers to the complete combustion, and not to the primary combustion only, as do also the figures given above (2·27). Now

for a straight coal gas having (say) the following proportions of combustible gases:

H	53 per cent.	×	2·38	126·1
CH_4	33 ,,	×	9·52	314·2
CO	5 ,,	×	2·38	11·9
Hydrocarbons	4 ,,	×	21·42	85·7
				537·9

or 100 cubic feet require 538 cubic feet of air, then 1 cubic foot requires 5·38 cubic feet of air.

The hydrocarbons are calculated as for propylene at 21·42. Now for carburetted water gas of the following composition:

CO	32 per cent.	×	2·38	76·16
H	34 ,, ,,	×	2·38	80·92
Hydrocarbons	7 ,, ,,	×	21·42	149·94
CH_4	16 ,, ,,	×	9·52	152·32
				459·34

or 100 cubic feet require 459 cubic feet of air, or 1 cubic foot requires 4·59 cubic feet of air.

It can easily be seen that the former gas must be made to draw in more air than the latter; and if the gas is changed from day to day (sometimes with water gas and sometimes without), the burner, to give the best effect, must be adjusted. The difference in specific gravity partly corrects this, as gas of ·6 specific gravity only delivers 80 per cent. of the quantity delivered of ·45 specific gravity through the same orifice at the same pressure.

If we hold a piece of gauze over the centre of a bunsen flame, it shows a red circle; but if we place it in the upper part of the flame, we shall find a red spot. This shows that the gas in the interior of the flame is not so hot, as it is not being consumed at that point, owing to the fact that the oxygen of the air cannot get to it in sufficient quantity to form carbon dioxide and water. When this gas reaches the outside of the flame, where it meets the air, then the two gases mentioned are formed, with the evolution of the heat. Therefore, it will be found that the hottest part of the flame is on the outside of it, at the point where the carbon dioxide is being formed.

With every burner there is a size of flame for every different quality of gas for which the burner is most suitable. Therefore, when any particular size of flame is required, the burner should be proportioned to this size of flame, and also to the quality of the gas. Now it is evident that it would be impossible to change the size of the burner whenever we put on a new make of mantle, or desired to heat a different sized vessel. But it is not impossible—although I allow it is difficult—to keep the gas as regular as may be. In fact, I can only repeat what I have so frequently mentioned in years past at different meetings of Gas Associations—the necessity for having not only constant pressure, constant heat value, but also constant regularity of composition. If we can cause a gas, by means of increased pressure and without any increase in consumption, to draw in an increased proportion of air, we shall be obtaining a flame of increased intensity of heat. If we double the pressure, we find the increase amounts to about 27 per cent., and with four times the pressure we have about 52 per cent. increase in the quantity of air drawn in for primary combustion. It is, therefore, evident that, in the case of richer gases, which require a larger proportion of air, we should have to deliver the gas at a higher pressure. In fact, if we wish to put in the full quantity of air so as to completely supply the oxygen required for combustion, we shall want a pressure of from 45 inches of water upwards. The exact pressure depends on the design of the burner, the length of the mixing-tube, the preheating of the mixture, and any other points about the burner which tend to reduce the easy flow of the mixture.

It must be remembered that good and bad bunsen burners with a given quality of gas give off the same amount of heat, as does also the flat-flame burner. The whole question is a matter of intensity and of the heat required for the particular purpose for which the burner is desired. For intensity of flame, as much air as possible up to the full amount for combustion should be introduced into the mixing-tube; and this mixture of gas and air must be thorough and even throughout if the full value is to be obtained. Further, we must remember that if burners are required for mantle heating, where the luminosity is said to vary as the twelfth to the fourteenth power of the absolute temperature, or for heating "radiants," or, as it was formerly termed, "fuel," in a gas-stove, the greater the intensity of heat in the flame the greater will be the radiation effect. If we have 2¼ parts of air to one part of gas, we obtain a maximum temperature of 2790° Fahr. in any part of the flame; with 3½ parts of air to one part of gas, the temperature mounts up to 2965° Fahr. in the hottest parts. These temperatures are those obtainable with the ordinary bunsen burner, but with the Méker the maximum temperature is 3038° Fahr.

Now, it is evident that if the gas draws in a larger proportion of air at the base of the mixing-tube, less air will be required to be taken up from the atmosphere round the flame, and a smaller quantity will be more readily obtained than if a larger amount were needed. Hence the flame becomes smaller; and the full amount of heat, which the gas is capable of, being contained in the smaller flame, the flame will have to be more intense. One of the difficulties with the bunsen burner, and one of the principal grounds used by advocates of low-quality gases for their preference, is that the richer the gas the more air is required, both for primary and complete combustion, and that this increased quantity of air has to be drawn into the mixing-tube by a lesser quantity of gas. Now this can only be done by increasing the pressure at which the gas is sent through the nipple; and therefore in those places in Scotland where rich gases are still being manufactured, an endeavour should also be made to increase the pressure.

When gas issues from the nipple, its natural tendency is to disperse and expand on all sides; so that if the nipple is pointing into the end of a parallel tube the gas will quickly fill up this tube, owing to the expansion, and there is little room or power left in the gas to draw the air into the mixing-tube. Whereas, on the other hand, if the tube into which the nipple is pointing is bell-mouthed, it leaves room for air to be drawn in in conjunction with the gas before the expansion has fully taken place. The direction also in which the air passes to the nipple is of importance, and a burner, in which the holes (through which the air passes) give a current of air in the same direction as the gas flow, will cause the air to pass in more freely than if the holes are drilled in the side of the mixing-tube; and as the difference in weight of the air as compared with the gas quickly reduces the speed of travel of the latter, we must provide facility for the air to enter the mixing-tube. That is to say, we must see that there are no bends or sharp edges which would restrict the flow. Further, we must provide a smooth inner surface to the mixing-tube to facilitate the mixture and prevent any resistance more than is absolutely necessary to the passage of the mixture.

With the Venturi tube the enlargement on the upper side of the neck allows of the expansion of the mixture, and thus helps the mixing of the gas and air. In the early days, a small fan, driven by electricity, was used to ensure thorough mixture, and also to induce an increased quantity of air into the burner, because a burner must not only act as an injector and suck in as much air as possible with the least amount of exertion of energy on the part of the gas, but it must also form an intimate mixture between the gas and the air. Hence the use of the Venturi tube, where its spreading action above the neck increases the opportunity for mixing. If, however, this form of tube was adopted for the nipple, although it would allow a greater efflux in the same area, it would tend to spread the gas as it left the nipple; and this would reduce the induction of air.

As regards the shape of a burner-nipple and the quantity of gas it will pass through orifices of the same area but of different forms, we can learn something from the many experiments which have been made on the velocity of efflux of water through nozzles of different patterns.

THE VELOCITY OF EFFLUX.

	Per Cent.
With nozzle of "vena contracta" form	97
With simple taper tube	94
With plain parallel tube—	
Where bore is 1/25th to 1/36th the length	68
Where bore is ½ to 1/3rd the length	81
At average length of bunsen burner (say)	75
With orifice in thin plate	62

I am quite aware that the action of water does not follow completely the same rule as with gases, as the latter are compressible while the former are practically incompressible. Still, we can see the advantages of the different shapes; and the experiments shown will therefore not be entirely without interest and information.

The mixing-tube should be made of such a size as will enable the required quantity of gas and air to be passed through it; and this, of course, will depend on the pressure at which the gas is supplied. It is therefore evident that a change in composition of the gas, which may change the quantity of air required, will need, for perfect high-intensity combustion, a different size of tube, unless the pressure is increased to make up for the increased quantity of air necessary. The area of the nozzle should be contracted so as to be smaller than the area of the burner-tube if the latter is parallel, or if it be of the Venturi type, the nozzle should be about the same area as the contracted portion.

The length of a mixing-tube is of importance; and, within reason, the longer mixing-tubes tend not only to good mixing but will reduce noise, which is caused generally by the changing of the length of the inner cone of the flame—this movement causing vibration and noise. Noise may also be caused when a high pressure of gas is used to draw in the necessary air, as the air, rushing in, with many forms of air inlets, will cause a noise. If, however, a certain proportion of air—say, an equal quantity to the gas—is mixed with the gas beforehand, this noise will be much reduced. If, however, too long a tube is used, it will destroy the bunsen flame and make it become luminous; and if it is excessively long, the resistance, due to the friction of the side of the tube, becomes so complete that the gas, as well as passing up the tube, will also issue from the air-holes. The nozzle of the burner is better to be of a non-conducting composition, so as to prevent the robbing of the heat of the flame by conduction, in the same way as was found advantageous in the case of the flat-flame gas-burner, which was much improved when it was made of steatite or fire-clay, in place of the old iron burner. Where gauze or perforations are used at the outlet of the bunsen burner to prevent lighting-back, the area of such spaces should about equal the area of the neck of the tube.

The position of the nipple with reference to the mouth of the mixing-tube, as regards its projection into the latter, has a great effect on the quantity of air drawn in; and this can be used for the purposes of rendering a burner satisfactory with different qualities of gas, which, of course, would require different quantities of air. But if the candle power, heat value, and composition

of the gas vary greatly, no one burner-tube can be made so as to give the best results as regards intense heat. Small variations, however, will not have such a great effect as to upset the working of the burner. It should be again mentioned that the total heat emitted by the burner when giving a poor flame is exactly the same per cubic foot of gas consumed as if the flame were of the most intense order. Burners should, therefore, be made so that they can draw in a sufficient quantity of air to make the burner light-back with rich gases, even when the gas is supplied at 3 inches pressure; and, on the other hand, they should be able to curtail the air supplied to such an extent that a luminous flame can be obtained even with low quality gases.

The nipple would answer better if the diameter could be reduced or enlarged as desired; but as this would be very difficult to adjust, and, in fact, to manufacture at all, the use of the taper needle has been found more convenient to make and easier to work. However, this needle must be capable of moving up and down exactly central in the aperture through which the gas passes. This is necessary so as to ensure an equal mixture of gas and air throughout the mixing-tube. If the needle be out of the centre, then more gas and less air will pass up one side of the mixing-tube than up the other, and hence an uneven body of flame will be found; and if this is used for mantle heating, it will cause greater expansion and contraction on one part of the mantle than in another, and the consequent rapid destruction of the mantle. Then, again, a smooth inner surface to the nipple is required to facilitate the passage of the gas, and to ensure that it is issuing at the full pressure.

In the report of the Gas Heating Research Committee of the Institution of Gas Engineers for 1911, they stated that they found that several holes in the nipple gave better results than a single hole, but suggested that an adequate supply of air should be ensured around each jet, so that the increased surface of the jets could be utilized. The trouble with such burners, where several holes are provided, is that the air cannot get to and around the gas-jets, and the extra surface of the gas is therefore wasted. The mixing-tube also is not the right shape for several jets, and good mixing of the gas and air would not result. It is quite true that if the jet has an area of one, the circumference is 3·55; and if three jets be used each of an area of 0·33, the circumference of these jets rises to 6·126, or nearly double the surface of gas, to cause induction of air by the friction of their surfaces. An arrangement which might answer the requirements of this Committee is the one shown, with three separate mixing-tubes, each with its nipple and air-holes. The one shown, however, is not well designed, as the shape of the nipple and the air inlets is not constructed so as to ensure the maximum of air for primary combustion.

The effect known as lighting-back is generally only imperfectly understood. If there were no movement of the gas and air in the mixing-tube, the flame would rapidly pass down the mixing-tube and ignite the issuing gas at the nipple. The movement of the mixture, however, prevents this trouble, provided it is of sufficient speed to overcome that at which the mixture lights. This speed of ignition varies considerably with the composition of the gas; and the subject has been considerably experimented upon, on account of its importance in connection with internal combustion engines. In these engines, which are now being run at a very high speed, it is, of course, important that the spark igniting the mixture should be able to complete the combustion within the short time that the piston moves downward. It has been found that gases containing large proportions of hydrogen ignite more rapidly than those containing more of marsh gas; and marsh gas, again, is more ready to ignite than those gases containing carbon monoxide.

The same property governs the liability to light-back, as the more rapid spread of the ignition in the cases of the hydrogen makes it light-back easier, and, consequently, gases rich in hydrogen must have a higher rate of travel through the mixing-tube than gases with marsh gas or carbon monoxide in predominance.

The use of gauzes in the mixing-tube is, of course, to prevent the passage of the flame back to the nipple; and it does this on the well-known Davy safety lamp principle, by absorbing and dissipating the heat of the flame, and so preventing the ignition of the gases on the other size of the gauze. If we can ensure that the movement of the gas and air is sufficient to keep the mixture from lighting-back, we can dispense with the gauze and its necessary obstruction to the injection action of the gas.

While upon the subject of hydrogen, it might be well to point out that, when judged by weight, this gas is the most valuable heating constituent in that complex substance which we call coal gas; but when referred to in proportion to its volume, it is the least valuable—

Hydrogen	=	284	B.Th.U.	per	cubic foot
C.O.	=	342	,,	,,	,, ,,
CH_4	=	954	,,	,,	,, ,,
Ethylene	=	1510	,,	,,	,, ,,
Propylene	=	2242	,,	,,	,, ,,

The extremely light nature of hydrogen is frequently lost sight of, because some engineers aim at increasing the quantity of hydrogen with the mistaken idea that they will thereby increase the calorific value of their gas.

A brief discussion followed the reading of the address, which was illustrated by a number of experiments.

Mr. H. Rule (Kelty) expressed the opinion that the improvement effected in connection with gas-cookers had not been nearly so marked as that made in gas-fires.

The President (Mr. A. Bishop) asked Mr. O'Connor to explain how to go about getting a constant quality of gas.

Mr. O'Connor, in reply, said he was not prepared to admit that gas-cookers had not shown as marked improvement as gas-fires had done. He could remember when cookers were not jacketed, and when the flame was entirely outside the oven. Now that the flame was inside, and having regard to the enormous reduction of heat caused thereby, as well as by the jacketing, he thought there had been a considerable improvement in the cooker. The heat inside was not required to be intense—a temperature of about 3000° Fahr. would scorch up the food in the oven; but a low-temperature flame from a simple bunsen burner gave the full amount of heat the gas was capable of supplying, and at such a temperature as would do the cooking as well as possible. In a gas-fire they required a very high temperature, so as to make the radiants give out a greater quantity of radiant heat; and, moreover, they wanted to heat the things in the room and not the air, which in the old days was solely heated. With regard to the President's query, the first thing to do in order to get constant composition of gas was to use coal of exactly the same nature and of the same quality. The other point was to keep the heat in the retorts constant, and the retorts filled to the same height. They must also see that the coals were always dry. These were the best suggestions that he could give with regard to keeping up the composition of the gas.

A vote of thanks was accorded to Mr. O'Connor for his address.

DETERMINATION OF HYDROGEN AND METHANE.

Herr Walther Hempel points out, in a paper in a recent number of the "Zeitschrift für angewandte Chemie," that it is easy to determine methane, when it is accompanied by a large proportion of hydrogen, by the Drehschmidt platinum capillary or the Winkler-Dennis combustion pipette; but that it is difficult to get concordant determinations of methane in other gases. Discrepancies arise through either incomplete combustion of the methane or partial combustion of nitrogen.

With Drehschmidt's platinum capillary, the methane is not completely burned—even with excess of oxygen—if the capillary tube is heated only with an ordinary bunsen burner; but complete combustion may be attained by a blast flame. The author has found, however, that the Drehschmidt platinum capillary may, with advantage, be replaced by a capillary of transparent quartz, in which a platinum wire which nearly fills the capillary has been introduced. Non-transparent quartz must not be used, as it is not perfectly gas-tight. The arrangement has the advantage that an explosive mixture of oxygen and combustible gas can be raised to very high temperature in the capillary without an explosion being propagated. The mixture must be passed slowly through the incandescent capillary. The quartz capillary is heated in a furnace with a blast from a hand-bellows.

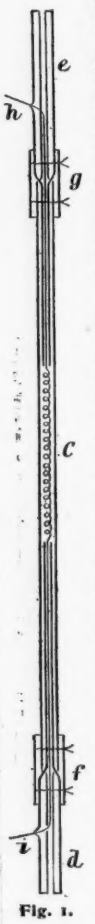


Fig. 1.

Experiments with the Winkler-Dennis combustion pipette have shown that it is difficult to burn completely the methane in mixtures of the gas with nitrogen. If a mixture of oxygen, nitrogen, and methane is heated for a long time in a combustion pipette, in order to ensure complete combustion of the methane, mercurous oxide is formed on the surface of the mercury, and the contraction is consequently too high. This error can be avoided by using an electrically heated platinum spiral in a transparent quartz tube, as shown in fig. 1, in which *c* is the quartz tube about 5½ inches in length, and ½ inch in internal diameter. Two capillary tubes *d* and *e* have their drawn-out ends introduced into the quartz tube at *f* and *g*. Through these capillaries passes a platinum wire, which forms in the middle a spiral twisted out of a length of about 7 inches of platinum wire 0·008 inch diameter. The quartz tube and the capillaries are connected at *f* and *g* by rubber joints; and the platinum wire is fused in the capillaries at *h* and *i*. The platinum wire beyond the coiled portion is of rather greater substance than the coil. Its ends are connected with a battery by clamps.

The author states that with either the quartz glass capillary with the platinum wire heated by a blast, or with the quartz tube with the platinum spiral electrically heated, as much as 80 c.c. of gas may be used for combustion without a measurable quantity of nitrogen being burnt, provided the gases are passed slowly through the tubes.

In regard to the determination of hydrogen in the presence of methane and ethane, the author points out that Winkler's method of passing combustible gas with oxygen slowly over palladium asbestos in a glass tube heated till the glass begins to show the sodium coloration, is satisfactory if the palladium asbestos is not heated much above 400°,

and the gas passes over it slowly—about 8 minutes for 100 c.c. It is difficult, however, by direct heating to prevent the temperature of some of the palladium asbestos rising higher; and in order to avoid this, the author has devised an arrangement consisting of a bunsen burner, above which is a block of brass having a vertical hole in which a thermometer may be placed, and a longitudinal channel in which the palladium capillary tube rests. The thermometer may, however, be replaced by an open glass tube containing some mercury; and the proper temperature is attained when the mercury reaches the boil. The flame of the bunsen burner is regulated accordingly. The palladium capillary may suitably consist of a capillary tube, about 5 inches in length and $\frac{1}{20}$ inch bore, into which a roll of palladium asbestos about $\frac{1}{30}$ inch thick and $\frac{3}{8}$ inch long has been introduced. With careful manipulation, the roll of platinum asbestos can be brought to the middle portion of the tube.

A piece of paladium wire about $\frac{3}{4}$ inch in length is introduced on each side of the palladium asbestos; and the ends of the capillary tube are then bent over for convenience of connection by rubber joints with the burette and pipette. Previous observers have not been in agreement as to the exactness of this method of fractional combustion of hydrogen when mixed with methane. The author has carried out a number of experiments which show that it is possible to determine hydrogen exactly in the presence of methane and ethane, provided the palladium asbestos is not raised to incandescence, and the temperature of the capillary itself is not much higher than 400° C. With the use of the arrangement here described, and observing the precautions referred to, a single passage of 100 c.c. of gas in about eight minutes through the palladium asbestos capillary gave exact results. In order to observe the rate at which the gas is passed through the tube, and to avoid too rapid a passage, the free end of the pipette may advantageously have attached to it a piece of rubber tubing sealed in water. The rate at which the bubbles of air escape shows the rate of passage of the gas.

The author says that Paal's method, with colloidal palladium, has the fault that the solution froths strongly, and it is necessary after absorption of the hydrogen to wait a long time for the froth to disappear, before the residual gas can be transferred to the burette for measurement. Moreover, the Paal and Hartmann absorption liquid loses its absorptive power on standing, even in the dark. Since, however, the solution is not affected by mercury, it can be prepared as required by mixing the reagents shortly before each test. The froth can be got rid of by fusing in between the bulb and the capillary of the absorption pipette a piece of glass tube $\frac{1}{2}$ inch long and about 0·28 inch in bore, containing a piece of small mesh platinum wire gauze. The froth disappears when it is drawn slowly through the gauze. The best and simplest means, however, of avoiding the froth is to introduce about $\frac{1}{4}$ c.c. of alcohol through the capillary of the pipette. The froth is at once destroyed. Palladium solution to which alcohol has been added cannot, however, be used again for the absorption; and the last traces of alcohol must be washed out from the pipette. The presence of oxygen in gases from which hydrogen has to be absorbed by palladium must be avoided. A small proportion of the oxygen disappears; but complete absorption of the oxygen does not ensue. It is best not to absorb the oxygen by phosphorus, as phosphorus vapours affect the palladium. The absorption can be hastened by applying the solution at about the body temperature. The palladium solution at that temperature absorbs in three minutes 29 c.c. of hydrogen per c.c. of solution.

The author prepares the palladium solution by taking 0·282 gramme of Kalle's colloidal palladium with 5 c.c. of distilled water, and after standing for twenty-four hours mixes the resultant solution with 10 c.c. of a cold saturated solution of sodium picrate. The 15 c.c. of solution thus produced will absorb rapidly 432 c.c. of pure hydrogen. The reagent may be utilized to the best advantage if used in two portions successively. The first portion absorbs rapidly; and the second portion will complete the absorption. The author has not succeeded in producing an active palladium solution according to Paal's directions.

In the analysis of gases with burettes filled with water, and absorption pipettes completely filled with reagents, exact results are obtainable only if the liquids are saturated with the gases which they do not absorb chemically. This saturation may be automatically obtained in a particular apparatus if it is used only for the analysis of gases which do not greatly differ in composition. But a pipette containing caustic alkali, if used for the analysis of coal gas, and immediately afterwards for the analysis of furnace gases, would lead to considerable errors. These errors may be entirely avoided if pipettes filled with mercury, and containing but little of the reagent, are used. But this method has the disadvantage that fresh reagent must be put into the pipette for each absorption, and the pipettes require a large quantity of mercury. Moreover, some reagents—such as fuming sulphuric acid and bromine—act on the mercury.

The author has endeavoured to construct apparatus which will avoid the errors of absorption by bringing the gas in contact with only so much reagent as is necessary. This apparatus is shown in fig. 2. The pipette consists of a cylindrical portion *A*, in which is a float *S*, and of the bulb *B* and the capillary *C*. The float is weighted by mercury so that it is about two-thirds immersed in the reagent. When the gas passes into such a pipette, the float separates it from the bulk of the reagent, and the gas comes in contact only with the liquid clinging to the walls. A number of analyses proved that errors of absorption are reduced to a minimum.

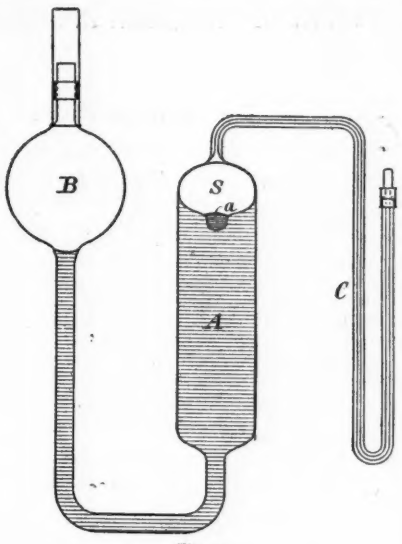


Fig. 2.

Fig. 3 shows a pipette by which gas may be brought in contact with small quantities of bromine. It consists of a bell *Z* held by the upright *St*, and an annular reservoir *M*, which is formed of two glass tubes *mK* fused together at *a*, and fused at the top so as to form a small cup *E* for the reception of bromine. *H* is a counterpoise weighted with water. In the top of the bell is a tiny vessel *N* having a narrow hole *L*. The cup *E* is charged with bromine, and the reservoir *M* with distilled water. The reservoir is then raised so that the bell passes into the annular

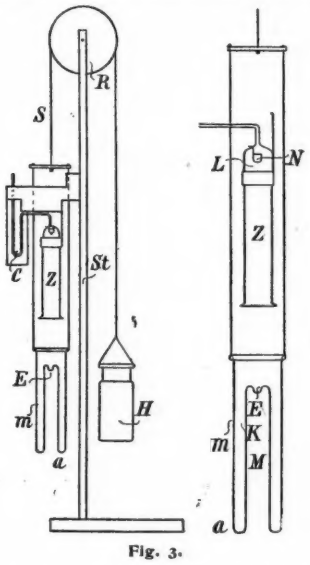


Fig. 3.

space; and the tiny vessel *N* fills itself with bromine. The water is sucked up until it fills the capillary *C*, which is then connected with a gas-burette. The gas is run into the pipette by lowering the reservoir *M*, the inner tube of which acts as a float in the bell *Z*. The bromine drops back through the opening *L* from the vessel *N* into the cup, and thus very intimate contact of the bromine with the gas to be examined is secured. The results obtained with the apparatus in the analysis of crude ethylene corresponded closely with analyses made with fuming sulphuric acid.

Proceedings at the Manchester Conference: A Correction.—We notice that in the report of the discussion of the paper read by Mr. H. James Yates at the conference of the British Commercial Gas Association at Manchester, as given in the "JOURNAL" last week, some remarks made by Mr. P. E. Culling, of Weston-super-Mare, were (by inadvertence) attributed to Mr. R. S. Hilton, of Birmingham.

Midland Association of Gas Managers.—We learn from the Secretary (Mr. Harold E. Copp, of West Bromwich) that the next meeting of the Association will be held at the Grand Hotel, Birmingham, on Thursday, the 31st inst., when Dr. W. B. Davidson will give a further communication on the subject of "Carbonization," introduced by him at the meeting in February, and dealt with further in articles in the "JOURNAL" for March 26 and April 9 and 23. The interest attaching to these communications should ensure a good attendance of members.

DETERMINATION OF NITROGEN IN FERROCYANIDES & SULPHOCYANIDES IN PURIFYING MATERIAL.

By Dr. Oscar Knublauch.

[Abstract Translation of a Series of Articles in the "Journal für Gasbeleuchtung."]

It occasionally happens that gas-works wish to sell their spent oxide for the nitrogen it contains instead of for the blue—especially in cases where the washing and condensing processes are inclined to be deficient. Dr. Knublauch has devoted considerable time and attention to the subject, with the object of finding out a standard method of determining the amount of nitrogen present, as, until recently, the various methods in use often gave different results. Moreover, it was not known whether the material to be tested could, without loss of nitrogen, be dried at a temperature of 120° to 140° Fahr., which was found in most cases to be desirable, in order to obtain a good average sample—especially in the case of those lots which are sold on the basis of their nitrogen content, because they contain the cyanogen in the form of sulphocyanides instead of ferrocyanides. These samples are generally too moist to allow of proper grinding.

The composition of spent purifying materials varies, of course, a great deal. Thus, two examples which came under the notice of the author contained the following:—

	Good Oxide.	Inferior Oxide.
	Per Cent.	Per Cent.
Prussian blue ($Fe_7(CN)_{18}$)	14·06	3·38
Sulphocyanic acid (HCNS) soluble	0·07	13·75
Ammonia (NH_3)	0·60	5·49
Total nitrogen	4·68	8·77
Proportion of total nitrogen as prussian blue	88·00	11·3

Besides this must be reckoned the nitrogen as insoluble sulphocyanide and that contained in the original material.

To work out the nitrogen from the percentage of ferrocyanide, sulphocyanide, and ammonia, each separately, was far too complicated a method, and by no means free from error. It is difficult to keep the insoluble sulphocyanides free from the soluble; the ferrocyanide present is not all in the form of true prussian blue; the amount of nitrogen present in the original oxide varies; and tarry particles containing nitrogenous substances often come right through to the purifiers.

However, the surest way of testing the reliability of any particular method was naturally to test by it each of the compounds in question containing nitrogen in known proportion. The method indicated to the author by thirty years' careful study of these compounds was to heat them strongly with soda lime. Accordingly, potassium ferrocyanide, potassium sulphocyanide, and ammonium sulphate were all treated by this method; and in each case the percentage of nitrogen found tallied very accurately with the theoretical percentage. A well-known Dutch bog iron ore which was also tested, contained as much as 1·04 per cent. of total nitrogen, of which 0·08 per cent. was in ammonia. This shows that the nitrogen in the purifying material itself cannot be neglected in the calculation. These experiments proved that the whole of the nitrogen present goes over in the form of ammonia, when the compounds containing it are heated with soda lime. The author accordingly proceeded to test by it an artificially prepared "spent oxide," made up to represent an inferior purifying material, as shown in Table I.

Table I.—*Artificial Inferior Spent Oxide.*

Components Taken for Three Grammes of Material.		Constituents in Material.	Nitrogen Present.
	Grammes.		Per Cent.	Per Cent.
Potassium ferrocyanide	0·2440	Blue [$Fe_7(CN)_{18}$]	5·51	1·61
Potassium sulphocyanide	0·3030	Sulphocyanic acid (HCNS)	6·13	1·46
Ammonium sulphate	0·5359	Ammonia (NH_3)	4·60	3·79
Sulphur	0·9171	Sulphur	30·57	..
Bog ore	1·0000	Bog ore	33·33	0·35
		Sulphuric acid and potassium in salts	19·86	..
Totals	3·0000		100·00	7·21

For the test with soda lime were required for 3 grammes of the mixture 15·56 c.c. normal acid. For 0·9171 gramme of sulphur + soda lime 0·02 c.c. normal acid = 15·54 c.c. normal acid, which corresponds to 0·2175 gramme of nitrogen = 7·25 per cent. The theoretical percentage of nitrogen is 7·21, which shows the accuracy of this method in use.

The apparatus constructed by the author is shown in fig. 1. The tube in which the mixture of purifying material and soda lime is heated up is about 40 cm. long and 11 mm. bore. The tubes R_1 and R_2 are fused on at *a* and *b*, reach nearly to the bottom of the flasks, and are bell-shaped at the lower ends. They are made wide enough to avoid any danger of the acid being drawn back into the heating tube, and at the same time to facilitate direct titration. The contents of II. can naturally be rinsed into I. S_1, S_2, and S_3 are air-tight stoppers. Flask II. contains only a little acid, with very little water. If, owing to an unexpectedly large quantity of nitrogen, the colour in I. changes during the experiment, more acid can be introduced at S_3.

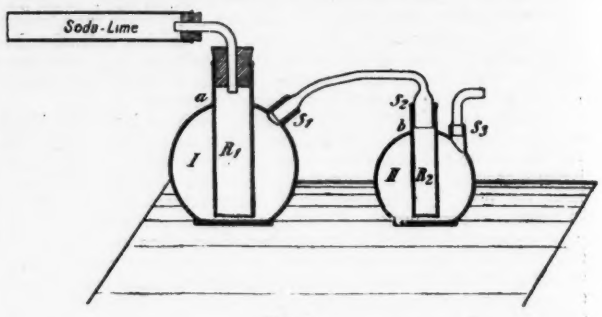


Fig. 1.

Tests were next made to determine what difference in the percentage of nitrogen, if any, is caused by first drying the spent oxide. Four different samples were taken and dried for five to six hours, at a temperature between 120° and 140° Fahr. The results obtained from these were next compared with those given by the same materials undried; and the differences in the percentage of nitrogen were − 0·31, + 0·51, + 0·38, and − 0·27. The loss in weight by drying varied from 12 to 17 per cent. in the four cases taken.

To determine the exact source of these differences, the apparatus shown in fig. 2 was used. The cylinder C stands in a beaker of water, and is provided with wire gauze at a short distance from the bottom. On this gauze are placed 10 grammes of the material to be tested, into which is brought the bulb of the thermometer T. The water in the beaker is now heated up to between 120° and 140° Fahr., and a stream of air dried by passage through calcium chloride is drawn through the cylinder. The smaller cylinders I. and II. contain a small known quantity of decinormal acid. III. contains caustic potash with a very little ferrous solution.

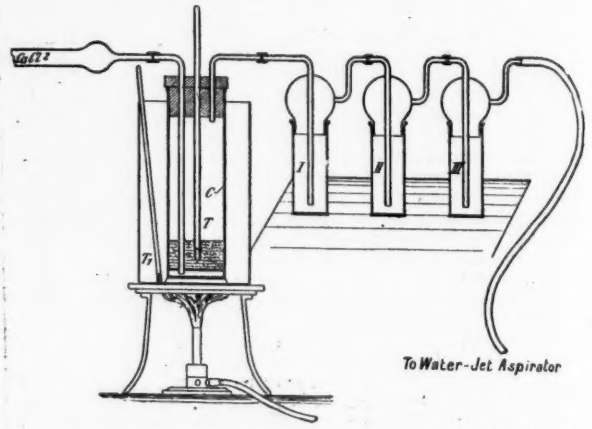


Fig. 2.

By this means thirty samples of spent purifying materials were tested; each test lasting five or six hours. The contents of III. were mixed with ferric chloride and hydrochloric acid; and were in each case left standing overnight. Even then traces of ferrocyanide were so minute that finally all thirty were mixed together to find the percentage of nitrogen in them. The contents of I. and II. were titrated back with decinormal caustic soda. The percentage of nitrogen from cylinder III.—*i.e.*, that which passed off in the form of ferrocyanide—was only 0·0012 for all the thirty samples, and so can be considered as negligible. The loss of nitrogen in the form of ammonia was found to be 0·003 per cent. for an average of twenty-nine of the samples taken; and 0·009 per cent. for all the thirty—one of them losing more than all the others together. Thus it would be safer to make this test first, and add the nitrogen found to the total given by the method described above; for it is clear from the experiments already mentioned (where four samples were tested, dried and undried) that considerable errors arise if the spent material is taken in its original undried form.

The great differences in composition of different spent oxides may be seen from Table II. The oxides, Nos. 1 to 4, are better than those produced in many works. Sample No. 6, on drying, lost volatile ammonia equivalent to 0·19 per cent. of nitrogen. But such a high proportion of ammonia as 6·25 per cent., which it contains, is rare, and indicates that the washing of the gas at the works in question was very faulty. Even when much ammonia

TABLE II.—*Composition of Different Specimens of Spent Oxide.*

Number of sample	1.	2.	3.	4.	5.	6.
Description of coal used in gas making	$\frac{9}{10}$ French, $\frac{1}{10}$ Saar.	60 per cent. Westphalian, 36 per cent. Saxony, 4 per cent. English.	Westphalian.	Westphalian.	Saar.	Westphalian.
Moisture, per cent.	13·00	14·00	29·00	16·00	7·67	20·00
Sulphur . . . . . per cent. of dried oxide	53·02	42·59	58·90	—	50·87	25·59
Blue ($Fe_7(CN)_{18}$) . . . . . ,, ,, ,,	13·40	11·40	11·20	9·08	7·47	3·90
Sulphocyanic acid, sol. (HCNS) ,, ,, ,,	0·28	3·58	0·52	0·21	3·28	7·19
Total ammonia (NH_3). . . . ,, ,, ,,	0·81	2·02	0·75	1·22	3·28	6·25
Equivalent sulphate of ammonia ,, ,, ,,	3·31	8·33	3·07	5·00	13·61	25·73
Nitrogen as blue . . . . per cent. of dried oxide	3·92	3·34	3·28	2·87	2·20	1·14
,, ,, sulphocyanic acid ,, ,, ,,	0·07	0·85	0·12	0·05	0·78	1·71
,, ,, ammonia . . . ,, ,, ,,	0·67	1·66	0·62	1·00	2·70	5·15
,, in other forms . . ,, ,, ,,	2·91	1·60	0·73	0·99	1·93	0·94
Total nitrogen	7·57	7·45	4·75	4·91	7·61	8·94

enters the purifiers, only very small quantities pass away from them. In fact, the average quantity of ammonia in the gas prior to the purifier may be computed from the average proportion of ammonia in the spent oxide. With sample No. 3 in Table II., the ammonia entering the purifier must have been about 6½ grains per 100 cubic feet of gas; with sample No. 6, about 122 grains. As a fact, the author has found 5-7ths of the latter quantity by direct determination in the gas in another case. Sample No. 6 is such that 10 tons of this spent oxide contain ammonia equivalent to 2¾ tons of sulphate of ammonia, from which a clear profit of £25 might have been made had it been extracted in the washers. This is equivalent to £3 4s. per million cubic feet of gas purified. Further, the amount of prussian blue in this oxide is too small to be worth working up.

Investigations showed that with sample No. 6, the alkalinity reckoned as ammonia, and the ammonia extracted by water and determined by distillation, were lower than the ammonia determined by suction in the manner already described; whereas with nine other samples of spent oxides they were higher. The author concludes that there is no need for another exact method of determining the nitrogen in spent oxide. Nevertheless he proceeds to describe comparisons which he has made between Kjeldahl's method, with and without modification, and the soda-lime method. He has also investigated the question of which of the nitrogen compounds occurring in spent oxide may cause errors in the determinations.

IGNITION OF COAL GAS AND METHANE BY MOMENTARY ELECTRIC ARCS.

By W. M. THORNTON, D.Sc., D.Eng.

[Abstract of a Paper to the Institution of Mining Engineers.]

The conditions under which single electric sparks fail to ignite mixtures of gas and air form a question of the first importance in regard to the safe use of electricity in coal mining. Wüllner and Lehmann investigated ignition by hot wires, and note the interesting fact that the gaseous mixture appeared to be ignited by iron and copper wires at the moment of fusion, at which point ionization becomes active. Heise and Thiem broke 196 small incandescent lamps, running at voltages from 65 to 220, in explosive mixtures of pit gas and air; and their chief conclusion was that thick filaments were more dangerous than thin ones. A fuller research of a similar nature has recently been carried out by Professor Lemaire, of Mons, Belgium, on both carbon and metallic filament lamps. His conclusion is that the incandescent filament of any lamp, however low the voltage, will cause ignition if exposed in an explosive mixture.

The new Coal Mines Act of 1911 prohibits the use of electricity where more than 1¼ per cent. of gas may be present, and limits the pressure to 20 volts in signalling circuits where the bare wires used may be touched together. It seemed well, therefore, to re-examine the whole case of the ignition of gas by single sparks such as may possibly arise in mining practice, especially at signalling voltages, with special reference to the influence of voltage, percentage of gas, and of differences between direct and alternating current. To connect these with gas-engine researches, experiments were also made with ordinary coal gas.

The occasions in which open sparking, as it is called, may mostly arise in practice are when a power cable is broken by a fall of roof, and on signalling circuits, either at momentary or vibrating contacts. In all these cases the final separation is between points of metal. The simplest way of obtaining a spark between metals at a point which may be renewed is that used in the present work by making contact between two round wires touching at right angles. The arrangement of these and of the explosion vessel used is shown in fig. 1. The latter was of well annealed glass, 5·5 c. in diameter, and had a volume of 300 c.c. The vertical exit-tube at the top was fitted after each explosion with a plug of cotton wool, the mercury was then raised to the level of the inlet, the air in the pipe fully swept out by gas from the reservoir, the top of the tube closed with the finger, and the explosive mixture drawn in by lowering the mercury. After the chamber had been filled with gas, the vertical tube was further covered with an india-rubber cap, which prevented diffusion and blew off easily at ignition. The pole-rods could be rotated by hand through an arc of 90°, and the speed of separation was found by trial to be nearly the same throughout at 3·5 radians a second. A metronome, set to a convenient frequency, served to give uniformity in the make-and-break when desired. The rods used were of iron, copper, and nickel. To determine each point on the curves, observations of 600 breaks were on an average recorded, or more than 50,000 in all.

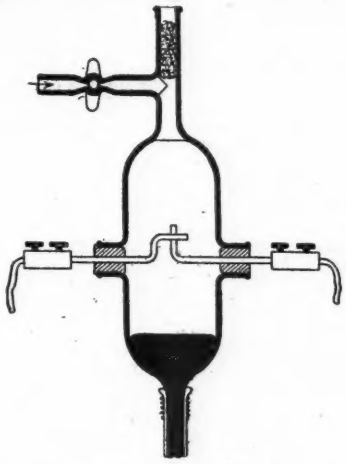


Fig. 1.—Explosion Vessel.

The procedure was to guess at a current and to make a hundred contacts in succession. If no ignition occurred, the current was raised and the trials were repeated. When a current had been found which gave ignition after the first few contacts, this was considered to be too high. The limiting igniting current was taken to be one which fired the gas within 50 sparks, slowly repeated. It being difficult to obtain pure fire-damp in large quantities, the first ignitions were made in a mixture of coal gas and air. In the case of mixtures of methane and air, it was decided to make all trials in the mixture giving perfect combustion—that is, 9·36 per cent. The results are noted in Table I.

TABLE I.—*Least Direct Current (Amperes) to Ignite a 9·36 per Cent. Mixture of Methane and Air.*

[Atmospheric Pressure; Temperature 18° C.]

Volts.	Iron Poles.	Copper Poles.	Nickel Poles.
50	4·00	4·000	4·00
100	1·05	0·900	1·15
240	0·40	0·175	0·55
480	0·10	0·050	0·15

At voltages below 50, the currents increase very rapidly; and it would appear to be impossible to ignite even the most explosive mixture of fire-damp and air by single-break sparks from a signalling circuit at the maximum voltage of 20 allowed by the Coal Mines Act.

In order to examine the influence of the size of the wire, the igniting currents of mixtures of coal gas and of methane with air were found with poles of iron, copper, and nickel in three sizes, at constant voltage. In all cases the igniting current is a linear function of the diameter. The higher currents required at the larger diameters appear to be proportional to the surface of the metal in contact with the arc and to its cooling action. With low-voltage apparatus, the inductance of the circuit is of the first importance from the point of view of safety at break. To examine this, inductances of from 0·0025 to 1·35 henries were placed in a 20-volt circuit, and the resistance adjusted until the current just failed to ignite an 11 per cent. mixture of coal gas and air. The risk of ignition increases rapidly as the inductance is raised, and no direct-current signalling circuit could be regarded as safe with a total inductance of 0·1 henry. The least energy required to ignite the mixture remains nearly constant at about 0·10 joule.

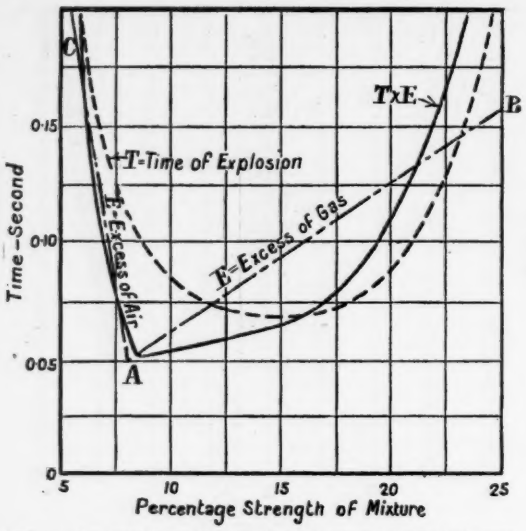


Fig. 2.—Suggested Synthesis of Curves showing the Influence of the Relative Proportion of Gas and Air on the Igniting Current.

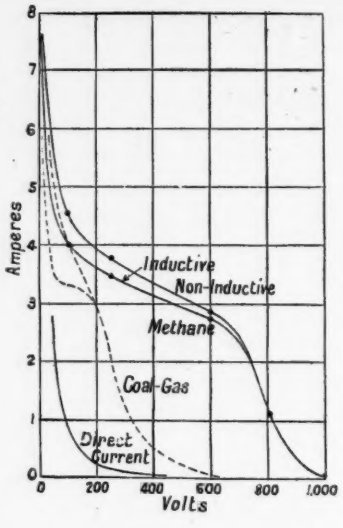


Fig. 3.—Alternating Igniting Currents for Methane.

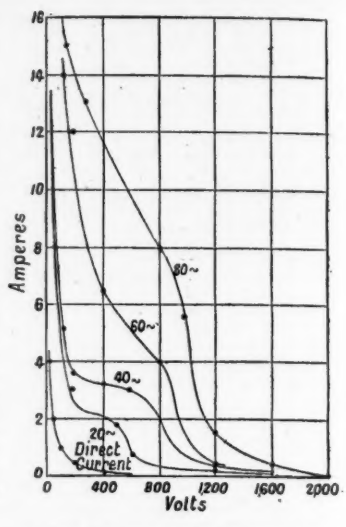


Fig. 4.—Influence of Frequency on the Igniting Current of Methane and Air.

It is, in thermal units, about 0·025 small calories, equivalent to the combustion of 4·1 c.c. of coal gas, or of 37 c.c. of an 11 per cent. mixture. At the highest inductance the energy was less, corresponding to the combustion of 21 c.c. of mixture.

The least current required for ignition in a circuit at a constant voltage varies considerably with the richness of the gaseous mixture. With methane no ignitions could be obtained at 4 or above 14 per cent. The limiting values under the present conditions would appear to be 4·25 and 14·25. The limiting percentages of mixture may, and probably do, depend on the method of ignition, and upon the presence of small quantities of more highly combustible gases. In the final report of the Royal Commission on Accidents in Mines, 1886, it is stated, "In some of our experiments, an ignition, with all the characteristics of an explosion, has been produced throughout the whole of our apparatus by a Davy lamp, when the current contained very little, if any, more than 4·25 per cent. of marsh gas."

The shape of the methane curve is very similar to that for coal gas. There is first a sharp drop curved to a point, from which there is a linear rise to a less well-defined bend, above which the mixture rapidly becomes inert. The suggested explanation of this is as follows: The two controlling factors appear to be (1) the "time of explosion," and (2) the reduction of sensitiveness to ignition by excess of either constituent of the mixture. In fig. 2, A is the most inflammable mixture. On either side of this the lines A B and A C give for any percentage the amount of dilution —to the left with air, to the right with the active gas; the upper limits being perfectly inert mixtures. The time of explosion T of a combustible gas is found in all the recorded cases to reach a minimum value, and to rise again as the strength of the mixture is increased. With coal gas, the curves of variation of T with richness of mixture are not so well defined. At the upper and lower limit, T approaches 0·4 second; the minimum (which is very nearly the same in all the recorded cases) is 0·05 second at atmospheric initial pressure, and occurs at 14·5 to 16 per cent. On either side of this T increases with excess of gas or air; but the branches are not usually symmetrical. No figures are available for methane; but the reciprocal of the velocity of explosion gives a curve similar in character, with a minimum at 13 per cent.

In every case of a combustible gas mixed with air, the time of explosion reaches a minimum in a mixture several per cent. richer than that required for perfect combustion. The curve of T lies between the upper and lower percentages limiting ignition, and is shown in fig. 2 symmetrical within them. The product of the excess of gas or air and the time of explosion is a curve agreeing closely in shape with that of the observed least igniting current. It would appear from this that these are the chief, if not the only, factors which determine the direct current or power required for ignition when the voltage and poles remain the same.

In the previous work, the influence of the time of duration of the spark, although masked by that of voltage, has been always in evidence. It was to be expected, therefore, that very different values from the foregoing might be obtained by the use of alternating currents. The first experiments on this were made at 40 periods with coal gas and air, and with the same density of mixture (11 per cent.) throughout. The currents required for ignition were all much greater than the direct currents at the same voltages. There may therefore be a very real increase in safety from gas ignitions by the use of alternating currents compared with direct, although when opening sparking does occur it is generally in excess of the minimum values found. An interesting result followed the addition of small inductance to the circuit. At the higher voltages, which were first examined, a perceptible, but not great, diminution of the igniting current was observed. At 200 volts the difference was greater, though the ratios were much the same; but at 100 volts there was evidence of an unexpected drop. At 50 and 25 volts, the gas was more readily fired than at 100. There is clearly some critical condition introduced by the use of alternating current in all these cases, or rather a third factor of equal importance with voltage and current. The influence of inductance on the iron curve further suggested that time might be this factor, and that the shape of the curves might be greatly affected by the frequency of the current.

Frequency is not, however, the only important factor, for the currents for iron and copper, although similar, are not identical, and the difference is still further brought out with nickel poles. The currents here are less than for either iron or copper, and so differ from the results with direct voltages. There is also in this case a remarkable sensitiveness to the composition of the gas. With copper poles (fig. 3) and at low voltage, the currents are rather greater than with iron. At the higher voltages they are lower; but the curves are very similar in shape. Both with coal gas and methane, the igniting currents are much lower with nickel than with iron or copper poles.

Experiments were made to ascertain the least igniting currents at various frequencies in 9·36 per cent. mixtures of methane and air, with small iron poles, and non-inductive circuits throughout. The results are shown in fig. 4. The influence of increase of frequency in raising the least igniting current, when the frequency is low, is very marked. There appears to be a critical point between 40 and 50 periods and at about 100 volts.

It is evident that at the lowest circuit voltages the current must be large in order to cause ignition by the liberation of a greater number of ions from the material of the pole. When, however, the maximum voltage gradient approaches 40,000 per centimetre, as it does on a 500-volt system at 0·017 centimetre length of arc —that is, within one-third of a period at a frequency of 40—the arc will be maintained whatever the current may be, and small currents then ignite the gas. At voltages between these limits of ionization by large currents on the one hand or high voltage on the other, the igniting current must be controlled by both; and since it has been shown that there is in the case of methane an evident relation between duration of arc and current required for ignition, the simplest expression taking account of duration and voltage is that the current is inversely proportional to the product of voltage and time of duration.

It is probable that the fact of alternation has less influence with longer periods of induction. This can, indeed, be shown experimentally by working with very dilute mixtures, in which the time of explosion is much longer. It may be concluded that when the duration of an arc approaches the period of induction of a gaseous mixture, ignition becomes increasingly difficult.

In conclusion, it may be said that, for the same voltages, the ignition of gaseous mixtures by direct currents would appear to depend chiefly upon the material of the poles, and ignition by alternating currents upon the nature of the gas.

The Harpener Collieries in Westphalia produced from their coke-ovens, in the year ending the 30th of June last, 18,952 tons of sulphate of ammonia, against 17,631 tons in the preceding twelve months.

We have received from the Hon. Secretary of the London and Southern District Junior Gas Association (Mr. Ernest Scears) the "Transactions" of the Association for the past session. The technical matter is preceded by accounts of the visit of the members to the Coronation Exhibition in the summer and to the Festival of Empire at the end of September. The proceedings, which are reprinted from the "JOURNAL" reports, occupy nearly 140 octavo pages; and they furnish a record of very good work. They are followed by a list of members and the accounts; and a portrait of the President (Mr. J. G. Clark, of the Gaslight and Coke Company) is given as a frontispiece.

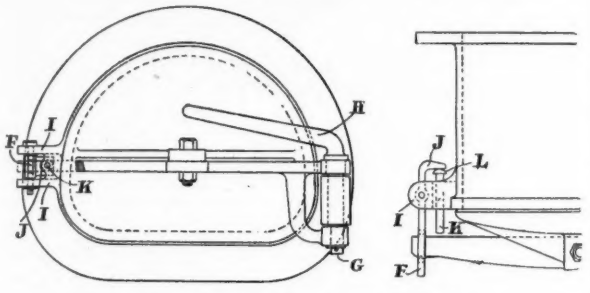
REGISTER OF PATENTS.

Retort Mouthpiece Fastenings.

LANGFORD, P. N., and SHILTON, W. A., of Coventry.

No. 27,642; Dec. 9, 1911.

This fastening for the lids of retort and other mouthpieces of the self-sealing type is applicable to all appliances in which the doors are supported by a hinged cross-bar and secured by a pivoted catch engaging with the free end of the cross-bar—a pivoted catch being provided so that the closing of the mouthpiece door will cause the catch to automatically rotate and engage with the end of the cross-bar.



Langford and Shilton's Retort-Lid Fastening.

The retort mouthpiece shown consists of a ∩-shaped body having a lid carried by a cross-bar pivoted at one end in a lug formed integral with the mouthpiece body. The other end of the cross-bar engages with a pivoted slotted catch F when the lid is closed, and finally tightened by rotating the eccentric hinge pin G by means of the lever H in the usual manner. In the present invention, the catch F, carried by the lug I formed integral with the mouthpiece body, is extended behind the pivot, and the end J is bent in the form of a bell-crank. The solid portion of the lug is drilled to form a guide for the tappet-rod K which has a rounded head L in contact with the end J of the pivoted catch. The tappet-rod projects some distance beyond the face of the lug, so that in closing the mouthpiece lid the left end of the cross-bar first strikes the tappet-rod, causing it to travel in its guide. The tappet-rod head L presses on the cranked end of the pivoted catch, causing it to rotate on its pivot and engage with the end of the cross-bar.

The invention also facilitates the opening of the lid. When the pivoted catch is rotated to disengage with the end of the cross-bar, the bell-cranked end J causes the tappet-rod to travel forward and force the cross-bar V carrying the lid away from the face of the mouthpiece.

Discharging Coke from Vertical Retorts.

TOOGOOD, H. J., and R. DEMPSTER and SONS, LIMITED, of Elland.

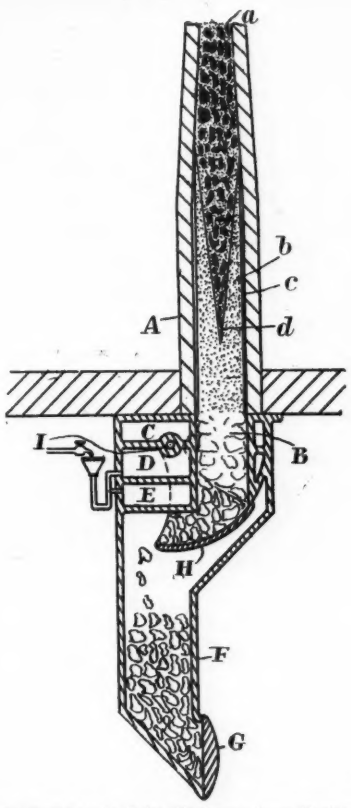
No. 17,616; July 22, 1911. Redated July 30, 1912.

This invention relates to "continuous" or "semi-continuous" vertical gas-retorts, and its principal object is "to facilitate the discharge of the coke without breakage, or in as large pieces as it can be induced to form within the particular retort."

In previous practice with gas-retorts of this type, the patentees point out, the advantages in the production of gas have been partially obtained at the expense of the chief residual product, coke, which is known to be inferior in size and density to gas-works coke as produced in other forms of vertical retorts. But this invention avoids the objection to a large extent, as the charge "moving downwards with greater uniformity, the formation of coke is harder, stronger, and denser, and thereby less liable to breakage on discharge, so that a smaller proportion of breeze is formed."

The invention is said to be based upon trials and experiments carried out by the applicants, by which they have found that the complex behaviour of gas coal under carbonization in gas-retorts is not analogous to the carbonization of shale coal in oil-shale retorts. It is known that cold, granulated materials stored in deep hoppers tend to self support by arching and bridging; some proportion of the total weight being borne by thrust direct by the vertical hopper sides. However, with an outwardly tapering vessel, such as a tapered gas-retort, the application of this principle was not generally known. In distilling shale for the production of oil in vertical retorts, the charge of shale retains its loose formation, and the charge will thrust upon the retort sides according to the above law and, to an extent, will be supported by such thrust. With the advent of the intermittent vertical gas-retort, practice has proved that the gas coals, as usually employed, quickly cake and form an annular ring of coke surrounding the gradually reducing core of coal, thereby relieving the retort sides of the thrust of the loosely-formed coal. This annular ring contracts as the distillation proceeds, owing to the escape of all volatile matter, and the resultant charge is a pillar of coke and coal resting with all its weight direct upon the lower lid and fastenings. As a consequence of this general knowledge and experience, "continuous" and "semi-continuous" gas-retorts for carbonizing gas coals have previously been made with stationary inclines, curves, tables or the like parts, so that the moving extractor mechanism could be applied in such manner as to escape the full weight of the charge.

According to the theory of the present invention, the action of all such stationary inclines, curves, tables, or like parts has created an anomalous condition within the retort, inasmuch as they tended to prevent the pillar of coke opening out into coke of loose formation, while the mechanism for extraction was applied to remove the coke—in other words, the pillar of coke was held, while the mechanism tore pieces from it; the consequences being breakage of coke and formation of



Toogood and Dempster's Coke Discharge from Vertical Retorts.

breeze, and a tendency to hang-up in the retort, necessitating poking, which, in the top portion of the charge, interferes with the process of coke formation, and in the lower portion of the retort causes disintegration and breakage of the coke.

According to their invention, the patentees abandon all such stationary inclines, curves, planes or like parts, and form their retort extension or cooling chamber with its cross sectional area at any part equal to, or greater than, the maximum cross section of the retort. They therefore constrain the charge of coke, after leaving the retort, to move slowly downward through equal or enlarged cross sections of cooling chamber, and the extracting mechanism is applied to receive the full cross section of the charge of coke.

By these means the gradual cooling of the coke gives rise to the formation of fissures, according to natural laws of contraction. The contracting coke entering equal or larger cross sections, these fissures gradually extend; and there being nothing between the slowly-moving mechanism and the full cross section of the charge, the mechanism assists in the gradual extension of the fissures until the pillar of coke separates in pieces of coke in loose formation with the minimum of breeze, and pieces thus disengaged in a natural manner with the grain are not, it is said, so readily broken again as would be pieces forcibly torn by mechanism against the grain. The loose formation of the coke, lying immediately above the mechanism and within the cooling chamber, acts, according to previously described laws, in thrusting against the sides, thereby tending to relieve the mechanism of some of the weight of the superimposed charge.

The extracting mechanism which they find most suitable, and which is described in patent No. 11,210 of 1912, comprises a reciprocating tray, which may be horizontal, inclined, or curved, arranged in such a position as to receive the coke directly from the oval or rectangular cross sectional portion of the retort. In the case of a curved tray, its movement gives a slight upward thrust, which assists in preventing bridging, by keeping the coke in the cooling chamber or retort extension continually in movement. The reciprocation of the tray causes the coke to be gradually discharged in small quantities. The series of trays in a number of retorts may be connected to a shaft or series of shafts along the bench, to which shaft a reciprocating rotary movement is imparted by any suitable means; while a safety device may be provided in connection with the shaft, to prevent damage in the event of the coke accumulating below the tray not being discharged in due time.

In the central vertical section is shown a retort and its appurtenances according to the invention. A is the retort, and B the downward extension extending from the heating flues to the extractor gear, and forming a cooling chamber surrounded by water-chambers or air-flues C D E. The secondary air may be passed through the flue C, the primary air through the flue D, and the flue E may be utilized for heating water or producing steam. Or this latter flue may be provided with a slide and connected to the main flue, so that cold air may be passed through it to assist in cooling the coke. F is the discharging shoot hopper or mouthpiece, closed by any type of lid G. The reciprocating tray H is driven by a shaft I.

The letter *a* indicates the coal which passes into the retort by gravity in the usual manner as the coke is extracted; the core of coal gradually becoming thinner and the outer ring or annular wall of coke *b* becoming thicker as they slowly proceed down the retort, and the pillar of coke shrinking so as to leave a small clearance space *c* next to the retort sides. The letter *d* represents the tarry lining of the annular wall of coke. In the cooling chamber B, the contraction of the coke causes

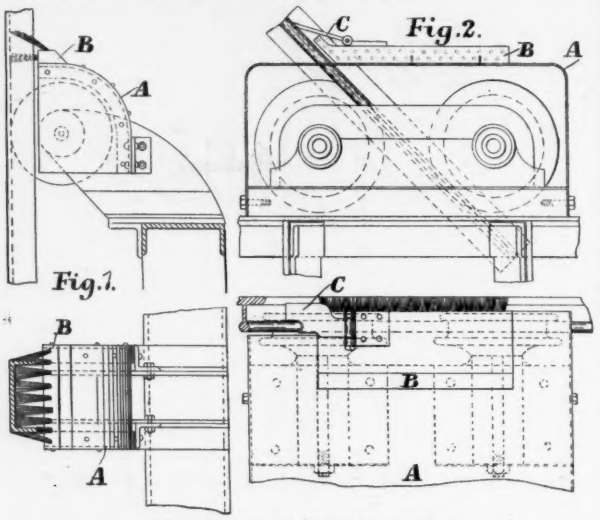
the formation of fissures; so that the coke loosely formed thrusts outwardly against the sides of the chamber, which thus bear a proportion of the weight of the charge above the chamber; and "the pieces of coke at the bottom, as they detach themselves or are gently shaken loose by the extractor gear, are removed without undue breakages occurring."

Gasholders.

BLAKELEY, W., of Thornhill, near Dewsbury.

No. 3254; Feb. 9, 1912.

The inventor proposes to provide each carriage and pulley or runner mounted therein (or it may be each pulley or runner) with a cover secured in the requisite position by suitable means, and a scraper, plates, brushes, or the like engaging the guides or rails, for the purpose of keeping them free from snow or other "foreign" substances which might prevent the proper working of the holder.



Blakeley's Gasholder Guide Brushes.

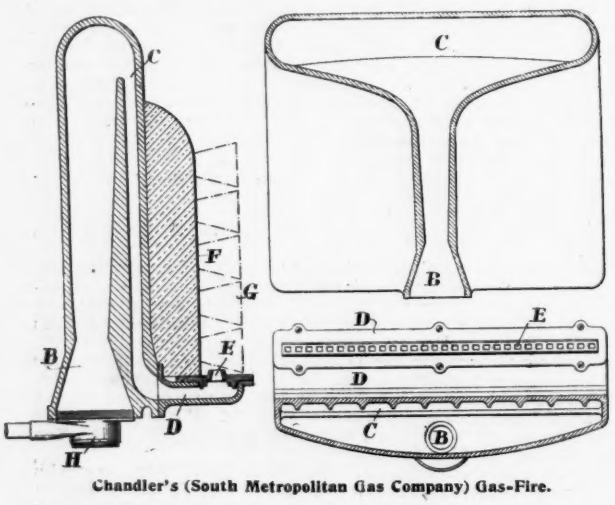
Referring to fig. 1, to the top of the angle iron cover A is secured a brush-box B, containing brushes or tufts of bristles which sweep the inside of the rail, and also, if desired, other brushes which sweep the outside of the rail. In fig. 2, the cover A consists of sheet iron or zinc the two sides of which are bent down at right angles to the top part and secured to the bed-plate of the carriage, forming a cover open back and front. The brush-box B is secured on the top of this cover; and on the top of the brush-box is a scraper C pivoted so as to engage the upper side of the guide-rail.

Gas-Fires.

SOUTH METROPOLITAN GAS COMPANY and CHANDLER, D., of Old Kent Road, S.E.

No. 11,777; May 17, 1912.

These gas-fires are of the kind that employ fuel of incombustible material placed over a row of atmospheric gas-burners in front of a vertically arranged fire-brick or tile. The mixture of air and gas is led to the burners through a chamber placed at the back of the fire-brick in such a position that it becomes heated by the products of combustion passing over the chamber before entering the exit flue, and also by contact with the back tile of the fire, so as to be preheated before issuing from the burner-nozzles.



Chandler's (South Metropolitan Gas Company) Gas-Fire.

The illustration shows a cross section of the gas-fire; a vertical section looking from the left; and a horizontal section (the tile and fuel having been removed).

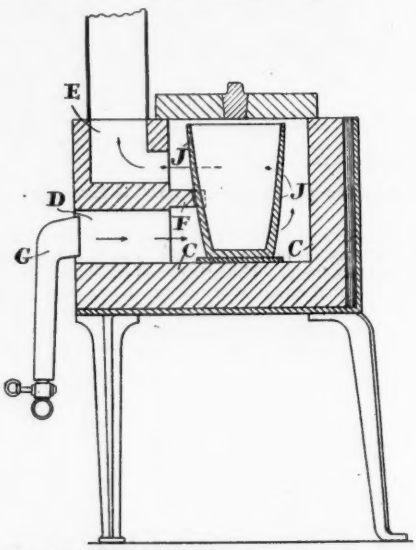
The fire consists of a metallic structure with a vertical inlet B for gas and air at the back, opening out into the upper part of a narrow chamber C next to the front. This chamber, which occupies the whole front space within the casting, opens at the bottom into a box D, which supports a row of burners E, and also the fire-brick or tile F and the fuel G indicated by broken lines. H is a gas-nozzle fitted into the mouth of the inlet or mixing-tube B. The gas, together with air, admitted through convenient holes (not shown), passes upwards and enters the chamber C at the top. Thence it passes to the box D and burners E. When the burners are alight, the fuel G and tile F soon become hot; and the hot tile heats the casting at its back and the gas mixture which passes through it.

Gas-Heated Crucible Furnaces.

FLETCHER, RUSSELL, AND CO., LIMITED, and FLETCHER, T. W., of Warrington.

No. 12,402; May 25, 1912.

This invention relates to the class of furnaces in which a crucible is placed within a fire-clay shell and heated by gas; the heat being caused to pass round the crucible before reaching the chimney.



Fletcher, Russell, and Co.'s Gas-Heated Crucible Furnace.

Within a metal casing lined with asbestos or other material that is a a non-conductor of heat is placed a fire-clay shell C provided with an inlet D for gas and an outlet E for the spent gases. There is a horizontal baffle F between the inlet and outlet passages, and at or near the inlet passage is fitted an atmospheric burner G, of ordinary construction. Within the fire-clay shell is a crucible J, enclosed by a cover.

The flames from the gas which enters at the inlet D under any pressure are caused to pass around the base and up the sides of the crucible by the horizontal baffle F; and then return around the upper portion of the crucible J. The spent gases pass through the outlet E, "thereby utilizing to the fullest extent the products of combustion."

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22,816.—ALEXANDER, G. H., and ROBINSON, W. G., "Meters, &c." Oct. 7.

22,842.—WALLIN, J., "Gas-lamps." Oct. 7.

22,856.—MACHINE GAS, LTD., and DEWSBURY, W. G., "Air-gas machines." Oct. 7.

22,897.—CORRAN, W. H., "Anti-vibrator." Oct. 8.

22,916.—PATMAN, L., "Gas toasting, heating, or cooking." Oct. 8.

22,970.—LAWSON, J., "Mixing air and gas." Oct. 8.

23,002.—SUTCLIFFE, J. H., "Carburetting air." Oct. 9.

23,090.—DANBY, C. D., and TYLER, S. F., "Acetylene or other lamps." Oct. 9.

23,092.—CHURCHILL-SHANN, M., and GOLDSWORTHY, W. H., "Gas-purifiers." Oct. 9.

23,126.—BARKER, W., "Gas-burners." Oct. 10.

23,149.—REDLICH, H. R., "Automatically closing valves." Oct. 10.

23,152.—GREER, D., "Reducing-valve." Oct. 10.

23,172.—MAGNUS, L. A., "Acetylene generators." Oct. 10.

23,173.—HUMPHREY, H. A., and RUSDELL, W. J., "Internal-combustion engines." Oct. 10.

23,211.—BOOTH, J. W. & J. F., and WILKINSON, A. H., "Indicator for lamps." Oct. 11.

23,217.—EASTWOOD, W., "Governors." Oct. 11.

23,242.—AULD, D., AND SONS, LTD., AULD, J., and GRAHAM, J., "Reducing-valves." Oct. 11.

23,256.—COUSIN, P. A. J., "Gas-producers." Oct. 11.

23,286.—CHURCHILL-SHANN, M., "Gas-turbines." Oct. 11.

23,308.—CLELAND, J., and STEWART, J. C., "Pressure-reducing valves." Oct. 12.

23,347.—WESTPHAL, C., "Connecting branch pipes to mains." Oct. 12.

23,348.—JEDRUSIK, A., and CZAJKOWSKI, S., "Roots' blowers." Oct. 12.

23,380.—STRACHAN AND HENSHAW, LTD., and SARGENT, T., "Telpher tracks." Oct. 12.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Education of Gas-Fitters.

SIR,—I read with some interest in your issue of this week, that at the Council meeting of the Institution of Gas Engineers held at Manchester, a Committee was appointed to approach the Department of Technology of the City and Guilds of London Institute in regard to the suggested introduction into their syllabus of a new subject for examination bearing on the matter.

I venture to suggest that the Council has made too free an interpretation of the excellent scheme drafted by the Manchester District Institution of Gas Engineers, and approved by the Commercial Sections and by the Institution itself. Mr. H. C. Head, of Winchester, at the discussion on the scheme last June, said that "this scheme is purely and simply one for the better education of working gas-fitters; and you will notice that in the report the word 'examination' is carefully omitted." Again, he makes his point "that we want to differentiate clearly that this is only the training and not the examination of gas-fitters." To this, the President replied: "I think we agreed to that. What you have said makes it very clear."

I emphatically endorse those views, and hope that when the Committee approach the City and Guilds Department, they will carefully eliminate the word "examination" from their deliberations. The City and Guilds of London Institute is apt to be regarded solely as an examining body; but I understand that this is not correct as regards its central operations.

In view of the present tendency towards the elimination of examination from modern educational methods, it is highly to be desired that strict adherence to the approved scheme be maintained.

I feel that I am violating no confidence in stating that at the meeting of delegates at Manchester in 1911, when the final scheme was settled, the representatives of trade and operatives Associations were unanimous in opposing any scheme which embraced "examination," but heartily endorsed the idea of the "education" of gas-fitters.

Much could be written in support of the above aspect of this important question; it is sufficient, I trust, to have pointed out the danger zone.

Cheltenham, Oct. 17, 1912. JAMES PATERSON.

Flues or No Flues, and Escaping Heat Units—A Practical Test.

SIR,—Having received no reply from Messrs. John Wright and Co. in substantiation of their statement that a "fire that carries off all its products without being attached to a flue will, when the ordinary chimney draught comes into play, inevitably carry off more than the products—to wit, an unnecessary number of heat units as well," and it having come to our knowledge that statements are being made to gas officials that we consider are derogatory to our trading interests, it is necessary to ask you to allow us further space to bring forward evidence showing the unfairness of the above-quoted statement. The statement that a fire will lose more heat under the influence of chimney draught than when no flue is attached must mean either that the radiant efficiency of the fire will be reduced by the action of the flue draught, or that heat will be carried away in the air drawn through the fire for ventilating purposes. As these two factors must operate together, it is advisable to consider their joint effect, which will be represented by the influence of the application of chimney draught upon the quantity of heat passing up the flue in a given unit of time. For the purposes of this investigation, a Davis fire of the new barless series and a fire of one of our competitors have been subjected to exhaustive tests; the object being to ascertain (upon the lines on which the tests were made as explained below) the relative effect of a chimney draught of different intensities upon the two fires under examination.

First of all, the competing fire was examined, and it was found that the flue-pipe, to a vertical height of 2 ft. 9 in. above the centre of the flue-nozzle cast upon the fire was required to ensure the removal of all the products of combustion by way of the flue; and it was found that, with this pipe attached, the flue gases contained 17·3 per cent. of oxygen, and had a temperature of 296·5° Fahr.—the temperature of the testing-room being 63·5° Fahr.

The Davis new barless fire was next taken; and it was found that the flue gases contained 15·3 per cent. of oxygen when no elbow or flue-pipe was attached, and the temperature was 499° Fahr.—the room heat being 69·5° Fahr. A flue-pipe was added in short lengths to the Davis fire, and a series of analyses of the flue gases were taken, and it was found that when 2 ft. 2 in. of flue-piping were attached, the composition of the gases was the same as in the case of the competing fire with 2 ft. 9 in., and 17·3 per cent. of oxygen was found. The temperature was 299°, and the temperature of the testing-room 69°. As the two fires were burning the same quantity of gas taken off the same supply, the temperature of the flue gases is an indicator of the flue-gas losses when the chemical composition of these gases is the same; a slight correction being necessary for the difference in temperature of the two testing-rooms. It will, therefore, be seen that the Davis fire with 2 ft. 2 in. of flue-pipe, and the competing fire with 2 ft. 9 in. of flue-pipe, give practically identical results—showing that the heat units passing per hour through the flue of each fire is the same.

An additional 2 feet of flue-pipe was then added to the competing fire; the effect being to increase the proportion of oxygen to 18·5 per cent., with an accompanying reduction in the flue temperature to 292°—the temperature of the testing-room at the time being 58·5°. Again flue-pipe was added to the Davis fire; but it was found necessary to add no less than 3 ft. 11¼ in. before the flue gases showed the same chemical composition, whereas only 2 feet of additional flue-pipe produced this effect on the competing fire's flue-gas analysis. With the 3 ft. 11¼ in. of flue-pipe added, the Davis fire showed 18·5 per cent. of oxygen in the flue gases; their temperature being 293·5°; the temperature of the testing-room being 66°—again showing, when the flue-gas analyses are the same, that the Davis and the competing fire are passing equal quantities of heat to the flue per hour. But it is well worth noting that the effect on the flue-gas analysis is greater per unit length of flue-pipe added on the competing fire than on the Davis—meaning that chimney draught will, beyond a certain point, have a greater effect upon the quantity of air drawn through the flue of the competing fire than through that of the Davis; and as each cubic foot of air added will carry away from the room a certain amount of heat which has been imparted to it by the fire, it will be seen that the quantity of air passing through the flue-nozzle has a direct bearing upon the room-heating efficiency. Assuming that the outside temperature is 40°, and the general temperature of a room heated by a gas-fire has been raised to 65° by that fire, it will be seen that the temperature of the air has been increased by 25°; and approximately every 2·2 cubic feet of air so heated absorb one British thermal unit of heat.

Reviewing the results obtained, it will be seen that the effect of adding air in equal proportions to each of the fires tested has the same effect on the flue-gas temperature—indicating that the same effect on the flue-gas loss is being produced. But equal lengths of flue-pipe do not produce the same result in each case. The addition of the flue-pipe to the competing fire caused the removal of more ventilating air than a similar addition would do on the Davis fire—meaning that a greater effect on the room-heating efficiency would be produced.

Again, it was necessary to add 2 ft. 9 in. of flue-pipe to the competing fire to ensure that the whole of the products of combustion were removed by way of the flue; and under these conditions the flue gases contained 17·3 per cent. of oxygen. With the Davis fire flue gases are satisfactorily dealt with without the assistance of any draught other than that naturally provided by the construction of the stove, under which conditions the products containing only 15·3 per cent. of oxygen are passed away, with the result that their temperature is considerably higher—namely, 499°. But this higher temperature must not be taken as an indication of greater flue-gas loss. The total weight of gases passing through the flue is reduced, with the result that an equal number of heat units is capable of raising the temperature of the flue gases to a higher point. In the case of the competing fire, with a large percentage of the products escaping beneath the canopy, it was found that the flue-gas temperature was as high as 415°, and that 15·6 per cent. of oxygen was contained in the flue gases.

If we consider the effect of the addition of 2 ft. 9 in. of flue pipe, it will be seen that, as the whole of the products under these conditions are being removed, the total quantity of heat passing through the flue has obviously been increased, as products which were previously escaping beneath the canopy are now taking their proper course; and despite this increase in the units of heat passing, it will be seen that the temperature has dropped from 415° to 296·5°—entirely disposing of the misconceived idea that temperature alone may be taken as an indication of the loss of heat passing per hour.

We think the figures quoted above will have made it clear that the effect of flue-draught upon a fire capable of withstanding the conditions laid down by the "Shadowgraph" method of testing is no greater than on a fire not so constructed, and that on the Davis fire the effect of flue draught per unit length of flue-piping is less than on the competing fire tested.

THE DAVIS GAS-STOVE COMPANY.

59, *Queen Victoria Street, E.C., Oct.* 18, 1912.

P.S.—May we, as a postscript, say that we have received from members of the gas industry copies of a circular-letter (dated Sept. 19, 1912) that has been distributed by Messrs. John Wright and Co., in which they obviously endeavour to ridicule the "Shadowgraph" method of testing without showing any foundation for the attitude taken up. In this circular-letter, they also repeat the statement which originated this correspondence and which we have challenged them—and challenged them in vain—to prove. With the facts given above, we leave the gas industry to judge the value of this unfair and unsupported statement.—D.G.S.Co.

The British Commercial Gas Association.

SIR,—I have read with considerable interest Mr. Carpenter's letter in your last issue; and I think he puts a case which accurately represents a very large number of gas undertakings in the country. Surely, however, in rightly extolling the merits of individual enterprise, he minimizes the cumulative advantage of joint action.

Mr. Carpenter, at the moment, is past "beating the big drum," and has developed into a "trumpeter." But when he has risen to appreciate the magnificence of a complete orchestra, he will find the results superior to the efforts of individual instruments taken separately.

Gas Offices, Chester, Oct. 16, 1912. FRED. A. PYE.

The Inviolability of a Parliamentary Contract.

SIR,—In view of the legislative action in relation to local gas companies now in course of progress in Australia, there may perhaps be no harm in recalling what so high an authority as Mr. Gladstone said as to the inviolable sanctity of a parliamentary bargain.

Speaking in the House of Commons on the 16th of May, 1889, in an important debate by a very full House, he said that the Chancellor of the Exchequer had rather appealed to him on the question, which was one of the most sacred of all questions—that of the inviolability of the public faith. The House of Commons could not make too great sacrifices for the purpose of maintaining that inviolability; and, moreover, he would say that at all times within his experience the House of Commons had never hesitated to make great sacrifices for the purpose of that maintenance. If the House of Commons had been extravagant or gone beyond the bounds of reason, it had undoubtedly been in the sense which was apparently adverse to the public—that was, they had given to the interest of the parties the utmost possible liberality of construction, and in that sense gone against the public, but they had felt that the true interest of the public, the supreme and paramount interest, was in the maintenance of the public faith. . . . He did not altogether agree with the honourable member for North-

ampton in the extension he gave to the doctrine of public faith. The hon. member stated that what one Parliament had enacted another Parliament might repeal. He (Mr. Gladstone) was not prepared to accept that proposition without limitation. Parliament for any pecuniary purpose was the fully authorized representative of the nation; and the nation, it appeared to him, must be committed by the deliberate act of its authorized representative, whether the act were in itself wise and just or unwise and unjust. Consequently, it seemed to him that where it could be shown that things were done under Act of Parliament which were unjust to the country, he was not prepared to say that Parliament was morally entitled—constitutionally, of course it was—and competent to go back on that declaration and repeal it. With the ideas he had of public faith, he thought that where Parliament of its own deliberate act, aware of what it was about, and having the intention clearly before it, had made an arrangement which took the nature of a contract with private parties, whether that arrangement was good or bad for the country, it was the duty of Parliament to adhere to it.

I quote the above from "The Times" of May 17, 1889.

H. D. ELLIS.

Oct. 19, 1912.

National Insurance Act, 1911.

SIR,—I enclose a copy of correspondence between myself and the Institution of Gas Engineers, with regard to the Umpire's decision No. 1072, which will, no doubt, be of interest to you.

R. W. EDWARDS.

Aldershot, Oct. 19, 1912.

[ENCLOSURE.]

Copy of Letter to the Secretary of the Institution of Gas Engineers, Oct. 14, 1912.

NATIONAL INSURANCE ACT, 1911.

With reference to the Umpire's decision No. 1072, as follows:—

"Workmen engaged in running gas-services from a gas company's mains in the basement of a block of tenements to the various rooms in the tenement."

I shall be glad to know what the Committee are doing in this matter, as it appears a contradiction of previous decisions.

Copy of Letter from the Institution of Gas Engineers, Oct. 18, 1912.

Replying to your letter of the 14th inst., I sent a copy of it to Mr. Wilson, of Glasgow, who, as you know, has been one of the most active members of the Committee having the matter in hand. I enclose herewith the reply received from him this morning.

Copy of Letter from Mr. Alex. Wilson, of the Glasgow Corporation Gas Department, to the Institution of Gas Engineers, Oct. 17, 1912.

I am favoured with yours of the 16th inst., with copy of a letter from Mr. R. W. Edwards, with reference to decision No. 1072 of the Umpire.

Enclosed please find copy of a letter I addressed to the Umpire as soon as the decision was published. I also advised Messrs. Cooper, of the Gas Companies' Protection Association, regarding the matter; and I am now awaiting a reply from the Registrar before doing anything further in the matter.

Copy of Letter from Mr. Alex. Wilson to the Registrar, Office of the Umpire, Unemployment Insurance, Oct. 10, 1912.

In the "Board of Trade Journal" for Oct. 3, I notice that decision No. 1072 has reference to "gas-services."

Might I be allowed to call your attention to the wording of that decision, which, in view of the former decision No. 779, appears to me to be rather indefinite. The Umpire's decision No. 1072 would be quite in accordance with his former decision if, instead of the word "mains" the word "meter" were used, as it has already been decided that contributions are not payable for services from the main to the meter. This would keep the service referred to in No. 1072 applicable to the fixed permanent pipes or carcassing inside of the building, which, I believe, is still what is intended by the Umpire.

Microscopic Growths in Leeds Water-Mains.

SIR,—I have read with great interest the article on "Microscopic Growths in Leeds Water-Mains" in the last number of the "JOURNAL." The organism is introduced to the reader as "a tiny microscopic vegetable growth." Instead of two adjectives as to the size, a figure in the usual microscopic unit—micron, or thousandth of a millimetre—would have given more definite information. "Vegetable" is most important, as bearing on the nature of the organism; but it is at the same time puzzling, as vegetable life, with light as an absolute requisite, is impossible in a dark main. A growth which "sets as hard as iron" and defies the "sledge-hammer" is also very remarkable, and so is an organism which is not stopped by filtration, even of a rough nature. It would be extremely interesting to know that organism by name. There is in biological science something which is called nomenclature, and which was started by Linnæus, even before 1750. It is the "Who's Who" of animals and plants, and as necessary to knowledge as a regular introduction of persons in social intercourse. Would you do me the pleasure of introducing me to that organism? *My* name is

AD. KEMNA.

6, *Rue Montebello, Antwerp, Oct.* 16, 1912.

Mr. MacLaren's Address to the Scottish Junior Association.

We have received from Mr. H. James Yates a letter on the subject of the inaugural address delivered by Mr. F. L. MacLaren, of Dumbarton, to the members of the Western District of the Scottish Junior Gas Association on the 5th inst., as given in the "JOURNAL" the following Tuesday, and our comments on it in the same issue.

In our article it was remarked that there was "not any considerable part" in the address that was "really new." Mr. Yates says he thinks it will be readily agreed that this was a very mild criticism when he points out that the address is composed almost entirely of matter taken, word for word, from papers, articles, or lectures which have for the most part appeared in the "JOURNAL," and all of which originated at the Essex Works, Birmingham. In support of this statement, Mr. Yates sent with his letter three pamphlets with certain portions marked, and the pages of the "JOURNAL" containing the address similarly marked; and a comparison of the two fully justifies his assertion. An unfortunate feature of the matter is that, in the course of the discussion, one of the speakers expressed surprise that the gas-fire "had taken so long a time to come to its present state;" and he attributed this to "the want of knowledge on the part of manufacturers in regard to the elements of the gas-fire," and to the fact that they were "not altogether posted up in the simple fundamental principles of scientific heating." The same speaker thought a mistake had been made in not issuing invitations to manufacturers to be present, "in order that they might have seen the President's experiments and reflected upon the simple facts." Mr. Yates considers that, in view of the source of so much of the address, these remarks should not have been allowed by the President to pass without some acknowledgment of the labours of those to whom he had been so largely indebted. A further point submitted by Mr. Yates is this—that any future utterances by himself or the staff at the Essex Works bearing upon the subjects in question, accompanied by the use of similar arguments to support them (and he points out that, when one is engaged in propaganda work, frequent repetition is unavoidable), will run the risk of being regarded as having been inspired by the address of Mr. MacLaren. It is with the view of preventing any such misconception, and with the highest appreciation of the investigation work done by Mr. Yates, Mr. Forshaw, and other members of the staff, that we direct attention to this matter.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

The business of the session was resumed, after the summer recess, on Monday, the 7th inst.; and among the matters since dealt with are the two noticed below.

Electric Lighting of the House.

On Monday last week, Mr. King asked the honourable Member for St. George's-in-the-East (Mr. W. Wedgwood Benn), as representing the First Commissioner of Works, whether the substitution of electricity for gas in the lighting of the Chamber of the House had been completed; whether the authorities were satisfied with the result; and whether it was possible to regulate the light, giving more or less brilliancy as might be required. Mr. Benn replied that the result of the change in the lighting was satisfactory, and that a greater or less degree of brilliancy could be secured.

East Surrey Water Order.

The above-named Order was one of those contained in the Water Orders Confirmation Bill, which had been passed by the Upper House, and been read a first time in the Commons. Its progress was blocked before the recess by six notices of motion for its rejection on second reading; but in the event of this stage being safely passed, Mr. Malcolm, the Member for Croydon, notified his intention of moving an instruction to the Select Committee to whom it was referred to delete the Order objected to. In the event of this motion being unsuccessful, Mr. Lamb, the Member for Rochester, intended to ask the House to instruct the Committee to insert provisions "prohibiting the East Surrey Water Company from extending their pumping-stations, wells, adits, machinery, and other works for obtaining water at Purley and Kenley, and from constructing new works in connection therewith, which would in any way detrimentally affect the Croydon Corporation's existing wells and works in that district."

The reason for this combined opposition to the Order will be found in the following epitome of a statement issued by the Croydon Corporation to Members of Parliament. Objection was taken to the proposal to confer large additional powers upon the Company, who are at the present time supplying water in an extensive area comprising upwards of 155 square miles, and extending from the southern boundary of Croydon to the southern boundary of the county of Surrey. A further objection was taken in that the whole of the supply of water for this large area is understood to be derived from two wells situated at the extreme north of the Company's limits, and in close proximity to the boundary of the borough of Croydon. It was stated that neither of these wells was expressly authorized by Parliament. By the Order it was proposed to empower the Company to raise a large amount of additional capital, and to apply £40,000 to the construction of powerful pumping machinery at Purley. The Corporation were advised that the effect of this would be to injure their water-works undertaking seriously, and subject the town to water famine at low springs by reducing the quantity obtainable, without which they will be unable to meet the necessities of the inhabitants. The Corporation contended that there was no justification for a Company formed primarily for the payment of profits to the shareholders, executing works which would interfere with the supply of water by a public authority to a large and growing urban community, and that their action in sinking the Purley well ought not to be confirmed by Parliament. It was therefore urged that no additional powers should be conferred upon the Company which would enable them to enlarge their pumping-station, or abstract further quantities of water passing to the wells of the Corporation.

The various notices above referred to had been on the paper since before the recess; and petitions in favour of the East Surrey Order had recently been presented by the Caterham Urban District Council and the Croydon and Godstone Rural District Councils; the last-named Council and the Reigate Rural District Council petitioning against alterations. This was the position last Thursday, when, towards midnight, after the House had been considering in Committee

the Government of Ireland Bill, the Water Orders Confirmation Bill was read a second time and committed, without opposition.

Mr. MALCOLM then moved that the Committee should be instructed to delete the East Surrey Order from the Bill. He said that his action was taken at the instance of the Corporation of Croydon, upon whom the duty was laid to supply the borough with water. When this great responsibility was laid upon them by Parliament, the population was about 19,000, whereas now it was over 175,000; and the cost of discharging this duty had amounted to very nearly £500,000 of public money. The East Surrey Water Company received parliamentary sanction in 1896 to acquire land, and in 1900, by a Provisional Order, obtained powers to draw water from the Croydon area. They were now applying for powers to take more water, and were not doing this by a Private Bill, but by a Provisional Order, which they sought to have confirmed to the imminent danger of Croydon. The whole of the Croydon drainage area yielded at present not more than 7½ million gallons of water per day, of which Croydon took 4 millions. The River Wandle required, for sewage and other purposes, a million gallons, and the Water Company took 2½ million gallons. They now asked —and it had been allowed by the Lords Committee—not only for the 2½ million gallons, but for an average of 4 million gallons a day from this area. That was to say, from this particular area, which could only supply 7½ million gallons of water per day, more than 10 million gallons were expected if the Order became law. This simply meant that, if the House assented to so dangerous a proposal for a private Company, the population of Croydon stood in serious and imminent danger of a water famine, and of the recurrence of those terrible outbreaks of fever which devastated the borough forty or fifty years ago. It meant, therefore, that, in order to satisfy what he did not deny was the legitimate ambition of a private Company, the public authority of Croydon was to be absolutely prevented from fulfilling the duty which had been imposed upon them by Parliament. He submitted that this was a question of principle which might be rightly raised in the House at the present time. Mr. Baldwin Latham—one of the greatest authorities on the subject of the chalk waters of England—had been retained by the Water Company; but they did not dare to call him when the Order was before the Committee of the other House, though he was present all the time. He (Mr. Malcolm) believed that if Mr. Latham had been called, the Committee would have been so impressed with his evidence that they would have reserved the Croydon water from the purview of the Order. He therefore confidently asked the House to support his motion.

Mr. J. SAMUEL, in seconding, said the Corporation of Croydon had spent more than £500,000 upon their water supply; and they and their engineers were under the impression that if the Order was carried out, and the Company were permitted to increase their pumping powers to the extent of 1½ million gallons a day, which meant 570 millions per annum, there would be a probability of a very serious shortage of water for the borough. The Company were undertaking to raise no less than £120,000 of additional capital; and he submitted that they ought to seek a fresh field for sinking their wells, so as not to interfere with water to which the Corporation of Croydon had a prior right, seeing that they sunk their wells before the Company.

Colonel RAWSON asked the House to send the Bill to a Select Committee, where evidence would be heard on both sides, and where people qualified to hear it would give their decision. Reference had been made to Mr. Baldwin Latham. In July last the Company intimated to him that he was at liberty to give evidence on either side. Consequently he was now free, and the Committee would be able to test whether he was right or wrong. The statement that if the fresh sources of supply proposed were taken by the Company there would not be enough water for Croydon, was one which he (Colonel Rawson) had not seen supported by evidence; and the Company did not believe it to be true. The Company were under statutory obligation to supply good and pure water, and, as a water authority, they were exactly in the same position as the Croydon Corporation. The Order for which they were applying was supported by all the local authorities in their district—not a single one of them opposing. He reminded the House that this question had been first of all subjected to inquiry by a Committee of the House, and the Order was allowed to go forward. Subsequently it came before a Committee of the House of Lords, who also passed it. Therefore the Company must have some strong arguments on their side, since both authorities had found in their favour; and it was surely a question that they had the right to ask the House to send to a Select Committee for investigation. They were quite prepared to abide by the decision.

Mr. J. M. ROBERTSON (Parliamentary Secretary to the Board of Trade) remarked that the Company were under a statutory obligation to supply their customers. The demand for water was increasing; and the Company wanted to pump more. The Croydon authorities feared that their supply would be affected, and said the Company ought not to be allowed to take more water. The Board of Trade did not consider they were competent to decide between the two parties; nor, he might respectfully suggest, were the House. The proper authority was a Select Committee, who could hear the whole of the evidence; and the right course was to let the Bill go before them.

After some further speeches, Mr. DENMAN moved—"That the question be now put."

The Speaker, however, declined to do this, and the debate was continued till past midnight.

Eventually, Mr. Malcolm's motion was put, and, on a division, was lost by 35 votes to 110.

Mr. LAMB then moved his instruction, the terms of which have already been given. He said he thought the division just taken showed clearly that the opinion of the House was that the Bill should go to a Select Committee; and he did not wish to contest the point. Still, he considered that a strong—almost an unanswerable—case had been made out in support of the contention that the Corporation of Croydon ought to receive full protection. He therefore asked the House to recognize the strength of the arguments adduced by adopting his instruction, which would ensure the Committee taking steps to save the existing wells and works of the Corporation from being detrimentally affected.

Mr. MALCOLM seconded the motion.

Mr. ROBERTSON submitted that his honourable friend was practically attempting, through his instruction, to raise again the question which had been already decided, though it was put in different terms. He said it was evident, from the figures in the division, that the House was quite satisfied that there ought to be no prejudging of the case, and that the Bill should go unhampered to the Committee. In these circumstances, he could only express the hope that his honourable friend would allow the whole matter to be dealt with elsewhere.

The motion was then put and negatived; and the House adjourned at ten minutes to one o'clock.

LEGAL INTELLIGENCE.

PROJECTING ILLUMINATED SIGNS AND LAMPS.

A Brighton Appeal.

At the Borough Quarter Sessions, at Brighton, on Monday of last week, the RECORDER (Mr. W. P. G. Boxall, K.C.) had before him an appeal by Clark's Bread Company, Limited, against the Brighton Corporation, on the subject of projecting shop signs. The Corporation served notices on the firm to remove certain lamps on which appeared their name over the pavement fronting their business premises in London Road and North Street. These the Company refused to comply with, on the ground that the action of the Corporation was illegal. The notices having expired, the lamps were removed by instruction of the Corporation; and the Company therefore entered an appeal.

Mr. G. M. FREEMAN, K.C., and Mr. W. W. GRANTHAM were for the appellants; Mr. E. MACMORRAN, K.C., and Mr. R. HARKER for the respondents; and Mr. W. JAGO watched the proceedings on behalf of the Brighton and Hove Gas Company.

Mr. MACMORRAN said the short point to be decided was whether the Corporation were acting within their jurisdiction in ordering the removal of certain lamps with the name of the Company on them, under the provisions of the Brighton Town Act, 1835. This Act had been to a considerable extent repealed; but the sections with which the Recorder was concerned had not. The two to which it was necessary to direct his attention were sections 76 and 256. There would be no facts in dispute. The Company carried on business in London Road and North Street; and in front of both premises there were certain projecting lamps above the pavement. He was prepared to accept the description given by the other side, according to which the lamps were 2 ft. 9 in. from the front of the window, and the bottom of each lamp 6 ft. 11 in. above the pavement in the case of the London Road shop, and about 7 ft. 11 in. in North Street. The lamps had glass globes 6¾ in. in diameter, and the word "Clark" was burnt into the glass of the globe in 1¾-inch letters. The Corporation had always been in the habit, when they had had to remove signs and take them away under this Statute, of telling those concerned that they would be returned on payment of the costs of removal. In this case a demand was made, and at first refused; but the Corporation came to the conclusion that they could not maintain this, and intimated that they would give up the lamps if they were sent for. Section 76 gave the Commissioners power to order that, within 14 days of notice being issued, any projecting windows, shutes, spouts, or signs, &c., which, in the judgment of the Commissioners, should be considered to be a public annoyance or nuisance by reason of their projecting into, or encroaching upon, or otherwise annoying or endangering, the public passage along any of the streets, &c., should be taken down and carried away or altered or reformed. If this were not done, the Commissioners could cause the same to be taken down; and the costs incurred might be recovered from the occupier of the house or building. Under section 256, his friends on the other side contended that there was a right of appeal to Quarter Sessions; but his submission was that on the construction of the section there was not. In June and July, the Borough Surveyor reported to a Committee on all the signs which projected in these two streets; and the number included the lamps or signs which were now in question. These reports came before the Improvements and Buildings Committee, who on each occasion passed a resolution, afterwards confirmed by the Council, that in their judgment the several signs were a nuisance by reason of their projecting, that notice should be given to the occupiers to remove them, and that in the event of their not being removed the Surveyor should have them removed, and the cost be recovered. The Council were dealing not only with Messrs. Clark's lamps, but with all similar projections in these two streets which, in their judgment, came within the description of signs specially mentioned in section 76. They regarded these lamps as coming within the description, because they were not merely lamps for illuminating the premises, but showing the name of "Clark" on them. This was why it was indicated that if the advertisement were removed from the lamps, no further steps would be taken. The general ground of the Company's appeal was that the lamps were not a public nuisance by reason of their projecting within the meaning of the Act. All that had to be proved in a case of this kind was that, in the judgment of the Corporation, particular signs were considered to be an annoyance or nuisance by reason of their projecting into the street. He did not suggest they were a danger. Dealing with the question of the right of appeal, he contended that section 256 of the Act did not give the Recorder jurisdiction. The portion of the Act relied upon dealt with a number of specific things, and then went on to deal with other obstructions and projections. Some were clearly obstructions; others might not be obstructions, but merely projecting signs which might be simply hung out in the street. In either event, the Corporation had jurisdiction to deal with them. They had dealt with them in this case as being a public annoyance or nuisance by reason of their projecting into the street.

The RECORDER: It is not the fact of their being signs. They must

be signs which, in the judgment of the Commissioners, are a public annoyance or nuisance by reason of their projecting.

Mr. MACMORRAN: A great many signs in the street may be a veritable annoyance, though not dangerous. They might (say) destroy the appearance and amenity of the street. It is not necessary, on the true construction of section 76, that they should be either obstructive to the passage of the street or dangerous. All that has to be proved in a case of this kind is that, in the judgment of the Corporation, particular signs were considered to be an annoyance or nuisance by reason of their projecting into the street.

The RECORDER: Must I not have some evidence whether this is an annoyance or a nuisance?

Mr. MACMORRAN remarked that the appeal would be against the judgment of the Council that the thing was a nuisance. The lamps were regarded as a nuisance by reason of their projecting into the street. The Corporation, rightly or wrongly, were acting upon the assumption that they had power to deal with what he might call the "amenities of the street," apart altogether from any question of obstruction or danger.

The RECORDER: Have they removed every projecting lamp in the street?

Mr. MACMORRAN: I think so. At all events, they have given notice to remove every projecting lamp in the list before you which comes within the definition of a sign.

Mr. FREEMAN: That list only comprises projections in the nature of signs. The lamps with no wording on them are not included.

The RECORDER: Then any lamp projecting into the street which has words upon it is claimed to come within this section; but these lamps do not differ in any way from other projecting lamps, except in having a name on them. I understand now that there is no necessity for evidence. The one point is whether, there being lettering on the lamp, that is a justification for treating it as a nuisance or annoyance within this section.

Mr. MACMORRAN: The Corporation do not say that a lamp without anything on it would not be a nuisance; but what they do say is that having an advertisement brings it within the term "sign," and that if it projects over the pavement they have a right to deal with it.

The RECORDER: It is not its size or height, but the fact that it has writing upon it.

Mr. FREEMAN, for the appellants, said the points here were two—one as to substance, and the other as to the legal right. As regarded the substance point, Mr. Macmorran had now admitted that the objection was not because these signs projected on to the street, but because they were signs which, in the opinion of the Corporation, were inimical to the amenities of Brighton. His (Mr. Freeman's) contention was that the Corporation had here exceeded their powers. Instead of taking the usual course—that of passing a bye-law which would be confirmed by an Act of Parliament—they had proceeded under an old Act which was passed for a perfectly different object. They had strained an Act passed for one purpose into something which was not contained in the Act itself. In the statement of facts, the Recorder had several very important admissions before him. In the first place, it was admitted that the brackets and lamps in question were not a source of danger to the public; and therefore any question of danger was absolutely swept out of the case. Then there was an intimation that if the advertisements were removed from the lamps, no further steps would be taken. Therefore it was not because there was a projection, or danger, or physical nuisance, or annoyance. In one case, the lamps were fixed 6 ft. 11 in. above the pavement, and in the other 7 ft. 11 in. above the ground-level; so that unless there were giants walking down the street, no one could be incommoded. His friend was in this peculiar position. A lamp could remain if there was no name upon it; but if the fatal word "Clark" appeared upon it, it became a nuisance. Without a name, these lamps, according to the other side, became absolutely innocuous. Could they find anything to justify this in the Act? Must there not be some relation to physical danger and annoyance? Not one scrap of evidence had been called to show that anyone had found these things an annoyance or had been incommoded in the slightest degree by them. This was the first time the appellants had had any opportunity of testing the statements of the Corporation or of giving evidence on their own behalf. The procedure was peculiar. The matter was put before a Committee of the Corporation by the Surveyor; and the Corporation, having received the report, passed a resolution that these things, in their opinion, were a nuisance and annoyance, and calling upon the owners to remove them. Before they did so, they did not take any judicial steps to ascertain what the true facts were. Nor did they give the appellants any notice that they were going to adjudicate on their signs, brackets, or lamps. They did not give them any opportunity of being heard or of informing them as to the true facts. So far as they knew, the Corporation acted purely on the recommendation of the Borough Surveyor; and he was not before the Court. Therefore, the appellants were in the position of having now the first opportunity of placing before any tribunal what the real facts were.

The RECORDER: Assuming the Corporation are perfectly right, they have to determine. That is the procedure provided. There is no reason why they should call upon the person in question.

Mr. FREEMAN: I say the Corporation, in all these cases, must exercise judicial qualities in determining.

The RECORDER: They are all inhabitants of the place, and have opportunities of seeing these things.

Mr. FREEMAN: That does not cover the case. Certain property of mine is to be taken away. Surely I should have an opportunity of going before the Corporation, and arguing the matter before them. It makes my case all the stronger. Having had no opportunity of going before the Corporation, we are told we are not to have the opportunity now. These lamps in both cases have been on Messrs. Clark's premises over four years; and there has never until now been the slightest suggestion of an objection either from the Corporation or the Surveyor. They have been a great convenience, because they not only light the shop but reveal to people in the dark in the street the name of the shop they want. They are exceedingly common in Brighton; and, as an instance, one of these lamps with a name upon it belongs to the Chairman of the very Committee who signed this notice, and that lamp is now up. He was going to prove that these lamps were carefully regulated and attended to by a large body of men in the employ of the Gas Company, and that in no sense did they form an annoyance or a nuisance. Under these circumstances, there could be no question here. The Corporation had strained the meaning of an Act (which was to protect people from physical annoyance and danger) into a totally different object—the preservation of æsthetic amenities. As to whether there was any appeal in these cases, it would certainly be unusual, he might say unprecedented, for the Corporation, without any right of appeal or anyone being heard in defence, absolutely to take away the property belonging to these people. In all other Acts dealing with projections and sky-signs, the matter came before an independent tribunal, and was dealt with there after hearing both parties. It would be a most extraordinary thing if the Corporation had the right, without the slightest restriction of any kind, to decide that the thing was an annoyance or a nuisance, without having had before them any evidence whatever.

Mr. *C. E. Clayton*, examined by Mr GRANTHAM, said that without the lamps in question the lighting of the street would be much less, and the illumination of the shop itself would be considerably affected. Possibly the lights being there had saved the Corporation having to put up more lamp-posts.

The RECORDER: Can you tell me any way in which these lamps become a nuisance to the public because the word "Clark" is on them?

Witness: I have searched my ideas, and I cannot find one.

Would not the practice of putting names or advertisements on signs possibly lead to a nuisance or annoyance?—Certainly. I can conceive signs that might be a nuisance.

You can conceive lamps which might be a nuisance because of the wording upon them?—I cannot conceive that, if it is only the name of the owner on it.

Mr. *C. H. Sandeman*, the Manager of the Store and Fitting Department of the Brighton and Hove Gas Company, produced one of the lamps in question, and said there were a great number like it employed in Brighton. There were over 2000 inverted outdoor lamps in use in the town; but not all of this pattern. This lamp was for one light; but the majority were larger, and there were many for three lights. He should say there were about 1700 of this pattern in Brighton, Hove, and district; and of this number, over 1000 were in use in Brighton. They lighted the inside of the shop-window from the outside, and the pavement as well. The Company provided the lamps, and attended to their upkeep; and those in question were about the smallest size.

Mr. FREEMAN at this point intimated that he had other witnesses, but did not think it necessary to occupy more time by calling them.

The RECORDER reserved his judgment until the next sessions.

A Pipe-Layer's Sunstroke not an "Accident."

At the Shoreditch County Court last Thursday, his Honour Judge Cluer had before him a claim made by Ada Dowsing, under the Workmen's Compensation Act, against the Metropolitan Water Board, for £218 in respect of the loss of her husband. Mr. Henriques appeared for the plaintiff; Mr. Ross Brown represented the Board. The deceased was a trenchman in the Board's employ; and at the time of the great railway strike last year was engaged with many other men digging trenches and laying pipes for the supply of water to the soldiers encamped on the Hackney Marshes who were guarding the railway line. On Aug. 18, he complained of the effect of the sun on his neck, and then became ill. In September he had to be removed to the Hackney Infirmary, where he died on the 25th. The deceased was working day and night; in fact, in one week he made no less than 44 hours' overtime. Dr. London, the Medical Officer of the Hackney Infirmary, said he certified that the man died from meningitis following sunstroke. Working long hours made him more susceptible to a stroke; but he would hardly have thought he received the stroke so far back as the 18th of August. His Honour could not see any proof that the deceased had died from an accident arising out of, and in the course of, employment. He was only exposed to the ordinary risk of a person in the street in a very hot summer. There would consequently be judgment for the respondents.

Selling Gas-Mantles under Alleged False Pretences.

At the West Ham Police Court, last Saturday, Gordon Bussereau and Percy Classing were charged on a warrant with conspiring to obtain money by false pretences. It was alleged that the prisoners had been going about all over London selling gas-mantles which were absolutely worthless, on the false pretence that they were representatives of the Gaslight and Coke Company. It was stated that several cases could be brought against them; and it may be remembered that they were each fined £2 at the Sutton Petty Sessions a few weeks ago, as reported in the "JOURNAL" for the 3rd ult. (p. 637). Evidence was given by Miss Wells, of No. 42, Rich Terrace, Richmond Road, West Brompton, who stated that on the 1st of August Classing called at the house and, saying he had come from the Gaslight and Coke Company, produced a mantle which he represented the Company were putting on the market. She ordered five of them, and they were delivered later in the day. The next day Bussereau called with the invoice, and asked for payment. She said she would forward the money to the office, as she had an account with the Company; and she remarked that the invoice appeared to her to be a very funny document. After some conversation, Bussereau went away, saying he would sooner do without the money than have any bother. Bussereau here said he told the lady he didn't come from the Gas Company, but from the Gas-Fittings Company. The Magistrate said he noticed that on the invoice the name of the Gaslight and Coke Company was stamped with a rubber stamp. Edward Turner, of No. 23, Cathcart Road, Earl's Court, stated that he bought 1s. worth of the mantles. He was sceptical about the prisoner Bussereau being a representative of the Gas Company; but the man was so insistent in his statement that he was engaged by the Company to put the mantles on the market that witness eventually believed him. Prisoners were remanded.

MISCELLANEOUS NEWS.

GAS COMPANIES' PROTECTION ASSOCIATION.

Report of the Committee.

At the Fifteenth Annual General Meeting of the Association, which is to be held at the Westminster Palace Hotel, Victoria Street, S.W., on Thursday, the 31st inst., the Committee will present the following report, together with the revenue account and balance-sheet covering the year to Sept. 30.

The expenditure amounted to £666. The revenue was: Subscriptions, £534, interest on Consols (less tax) £40, together £574; leaving a deficit of £92—special costs having been incurred in resisting a number of bad precedents.

The balance-sheet shows that the assets amount to £2151, which is represented by £1691 of 2½ per cent. consolidated stock at cost price (namely, £1523); balance at bank, £623; and cash in hand, £5.

The Committee report that their endeavours to induce the President of the Local Government Board to receive a deputation from them in reference to the amendment of the Electric Lighting Acts referred to in the Committee's last report have not yet been successful.

The memorial to the Prime Minister with reference to the Trades Disputes Act, 1906, also referred to in the last report, was duly presented to the Prime Minister, who, however, declined to receive a deputation upon the matter.

The Committee considered the Bill promoted by the National Electric Construction Company for the purpose of legalizing certain agreements with reference to the wiring of consumers' premises, which had been entered into by that Company, or their predecessors in title, and certain local authorities, which agreements were similar to those which the Law Courts had held to be *ultra vires*. As this was a matter which in the opinion of the Committee was of great importance to gas companies, and there appeared to be ground for opposing the Bill on Standing Orders, the Parliamentary Agents were instructed to prepare and deposit a memorial against the Bill. This was accordingly done, and met with complete success, with the ultimate result that the promoters agreed to insert in the Bill a clause for the protection of the gas companies affected.

At the request of the Commissioners of Inland Revenue, the Committee carefully considered, and unanimously approved, the draft scheme for settling the vexed question of depreciation to be allowed on gas plant for income-tax purposes, which had been prepared by a Committee appointed by some of the principal gas companies on the one hand and the Inland Revenue Authorities on the other.

The Committee by themselves, and also in conjunction with the Institution of Gas Engineers, took a prominent part in the recent fight against the imposition of the "residuals clause" upon gas undertakings by Parliament, at the instance of the Alkali Manufacturers' Association. A deputation, comprising members of the Association and of the Institution of Gas Engineers, was received by the Lord Chairman, and at a later date by the Lord Chairman and the Chairman of Ways and Means, at which the case for the gas industry in opposition to the clause was stated at length. The Committee subsequently requested that the matter should be dealt with by a Joint Committee of both Houses of Parliament, to which the House of Commons has assented; and there is reason to expect that the House of Lords will also agree to the proposal.

The Committee from time to time considered questions affecting gas companies arising under Part II. (Unemployed Insurance) of the National Insurance Act, 1911, and ultimately appointed a Special Committee consisting of members of the Association and of the Institution of Gas Engineers to argue points arising under the Act before the Umpire. This Committee attended the Umpire on many occasions, when numerous questions were settled; and a report setting out the Umpire's decisions was prepared and circulated among members of the Association.

The National Health Insurance Commission having requested the Committee to nominate a gentleman to represent the Association to serve on the Advisory Committee under the National Insurance Act, 1911, the Committee nominated Mr. Charles Carpenter, Chairman of the South Metropolitan Gas Company.

The Committee received a communication from the Comptroller General of the Labour Department, Census of Production Office, enclosing specimen schedules which it was proposed to issue to gas companies under the Census of Production Act, 1906, and inviting comments thereon or suggestions for the improvement thereof. Mr. Carpenter, on behalf of the Committee, went fully into the matter, and made various suggestions for alterations in the schedules, which were duly forwarded to the Comptroller General.

The following are the principal matters upon which the Secretary has been consulted during the past year:—

Whether costs of promoting a Joint Bill should be charged to capital or revenue account.

Right of railway company to supply with gas a tenant situate within a gas company's area of supply.

Questions arising on incorrect registration by meter.

May a gas company increase the qualification of a director without amendment of Private Act?

Right of statutory company to issue at a discount debenture stock which had previously been unsuccessfully offered for sale at par.

Acceptance of tender for shares after time had expired for reception thereof.

Right of local authority to require a company to extend their mains for supply to public lamps, irrespective of distance of lamps from the main.

Liability of collieries for non-supply of coal in consequence of strike.

Right of a non-statutory gas company to refuse to supply consumer with gas owing to coal strike.

Right of surveyor to require company to remove excavation refuse.

Purposes for which Board of Trade can grant Provisional Orders.

Right of company to construct a railway bridge over a road.

Registration fee chargeable when probate is registered in respect of shares held in different rights.

May a director lend money to a company by way of debenture or mortgage?

Right of company to use a burner other than that prescribed by Special Act for testing purposes.

Questions arising on income-tax assessment.

Right of non-statutory company to manufacture gas on land belonging to them.

Position of gas companies with reference to recovery of gas-rents in arrear.

Power of Board of Trade to grant a Provisional Order enabling company to stop up a *cul de sac*.

Questions affecting gas companies under the Shops Act, 1911.

Damage to gas-mains caused in execution of sewerage works.

Diversion of footpath by gas company.

Right of consumer to demand supply of specific kind of meter.

Right of company to take proceedings against local authority or their contractors for damage caused to pipes in execution of work.

Mode of assessment of gas-mains.

Liability of gas company to pay land-tax in respect of land occupied by pipes.

Rent to be demanded for meter supplied to consumer.

Five Companies have joined the Association since the last annual general meeting—the total number of members now being 119.

The following members of the Committee retire in accordance with Rule 9:—

Mr. George Andrews (Swansea Gaslight Company).

Mr. Edward Allen (Liverpool United Gas Company).

Mr. Charles E. Botley (Hastings and St. Leonards Gas Company).

Mr. George Clarry (Cardiff Gaslight and Coke Company).

Mr. Douglas H. Helps (Reading Gas Company).

Mr. R. O. Paterson (Cheltenham Gaslight and Coke Company).

All of whom offer themselves for re-election.

THE MELBOURNE GAS INQUIRY.

Origin of the Investigation and Report of the Board.

It was mentioned in the "JOURNAL" last week (p. 169) that the Board appointed to investigate the affairs of the Melbourne Gas Company had made their report, and that a copy of it had been received. It occupies nearly thirty foolscap pages; and in an appendix are given the addresses of Counsel and the evidence, which fill 412 pages. The investigation was so important that it may be of interest to give an account of its origin and results.

The causes which directly gave rise to the appointment of the Board were the allegations made in and out of Parliament that the Melbourne Gas Company were exceeding their statutory powers, more particularly in regard to the moneys set aside out of profits, and appropriated to the reserve fund and other accounts. Towards the close of last year, as the result of a recommendation to His Excellency the Governor, Messrs. Thomas Hogg, John Andrew Arthur, and John Alexander Norris were nominated, with Mr. H. A. Pitt as their Secretary, to "inquire into and report upon the Metropolitan Gas Supply, particularly as to (1) the practice and legality of the Metropolitan Gas Company establishing reserve funds or accounts, or transferring profits earned in any year to accounts to meet contingent liabilities; (2) the propriety of altering the provisions of the Metropolitan Gas Company's Act, 1878, which regulate the dividends payable to the Company's shareholders; (3) the justice and equity of Parliament being asked to alter the provisions of the Act relating to the acquisition by the Municipalities of the Company's undertaking; (4) the conditions affecting the cost of production and distribution of gas, and the reasonableness or otherwise of the price charged to consumers; (5) generally as to all matters relating or incidental to the supply of gas within the metropolitan area."

The first public sitting was held on the 6th of February last, when Mr. W. H. Irvine, K.C., and Mr. H. E. Starke appeared, by permission, on behalf of the Company. The Government then appointed Mr. S. K. Hotchin to represent the public. In addition to the private meetings held by the Board, there were 36 public sittings at which 45 witnesses were examined.

The Board recognized that it was necessary, in order to deal adequately with the matter entrusted to them, that they should acquire a knowledge of the Company's history. They did so; and they preface their report with an outline of the incidents leading up to the origin of the undertaking, and give a synopsis of the results of its operations. Prior to 1878, there were three gas undertakings competing within the area now supplied by the Melbourne Company—viz., the City of Melbourne Gas and Coke Company, the Collingwood, Fitzroy, and District Gas Company, and the South Melbourne Gas Company. In 1877, an Act—the Metropolitan Gas Company's Act of 1878—was passed—providing for the amalgamation of the three undertakings, and for the transfer of their assets and liabilities to the Melbourne Company. Twelve months later, a Select Committee reported in favour of the right to supply gas being placed in the hands of the local authorities; but no action was taken in the matter.

The Company's operations have extended over a period of 34 years, during which time the total capital has been increased from £616,710 on Jan. 1, 1878, to £2,180,745 on Dec. 31, 1911. The total expenditure on capital account at the latter date was £2,182,737; so that there was an overdraft of £1992. During the period referred to, the number of cubic feet of gas sold was 41,905,232,000; and the gross revenue was £13,179,123, equal to 6s. 3·48d. per 1000 cubic feet. Manufacturing

and other charges amounted to £8,241,535, or 3s. 11·2d. per 1000 cubic feet. Of this sum, dividends, interest, reserve fund, and other special appropriations, took £4,879,877, or 2s. 3·95d.; leaving a balance at the credit of the net revenue account on the 31st of December last of £57,711, or 0·33d. per 1000 cubic feet.

Having given these introductory particulars, the Board proceed to deal *seriatim* with the specific subjects of inquiry submitted to them.

Reserve Fund, &c.

The Board point out that the second schedule to the Company's Act and that to the Gas-Works Clauses Act, 1871, are precisely similar, with the exception of the form prescribed for the reserve fund account. It is stated that the practice of the Company has been "to reduce the reserve fund by charging items which, under the English Act, would not be charged to the reserve fund, but charged directly either to capital or revenue." The Company may set aside up to 3 per cent. of the combined share and debenture capital; but the fund must not exceed one-eighth of the combined capital. The appropriations total £663,448; averaging for the whole period of the Company's operations 1·33 per cent. of the combined capital. Some credits for premiums on debentures increased this total to £664,044, which was applied as follows:

Coal strikes and other contingencies	£72,412
Equalization of dividends	13,000
Extension and improvement of works and plant	470,827
Acquisition of land, &c. (less credits for sales)	20,789
Balance at credit	87,016
Total	£664,044

It is now stated that of the total shown as having been expended on extensions and improvements of works, all such expenditure to the year 1903, amounting to £238,616, was for replacements, although entered in the Company's published statements as having been applied to extensions. During the year 1908 to 1911, sums were drawn from the reserve fund for capital purposes.

In addition to the appropriation to the reserve fund, other amounts have been set aside out of profits to the meter renewal fund, the gas-stoves account, the works reconstruction account, to meet depreciation of leaseholds, and to make special provision for coal and for the conversion of debentures. The Board deal in detail with these appropriations, and say that consideration of the facts set forth "shows that the Company's operations have been most successful." Dividends were paid ranging from a minimum of 8 per cent. to a maximum of 21½ per cent., except during the years 1891 to 1897.

The Board go on to show that the rapid upward movement in the sales of gas since 1901, culminating in the record sale of 2,101,077,000 cubic feet of gas last year, demanded the most urgent reconstruction, extension, and modernization of works. The sums provided for these purposes appear in the accounts summarized in the report under the heading of "Works Reconstruction Account;" and the Board question the legality of these appropriations. They say: "The Act provides for a reserve fund to assist the revenue in any year in which any extraordinary demand may arise. The claim of the Company that sums may be appropriated out of profits to the 'Works Reconstruction Account' and other reserve accounts at the discretion of the Directors, if valid, has the effect of removing any limits to amounts that may be set aside out of profits as reserves." The Board cite the paper read by Mr. Alfred Lass in December, 1888,* in which, referring to the provision of funds to meet future renewals, he stated that gas companies were not authorized by their Acts to create such funds, and that if followed "that they must debit the revenue account with the renewals as and when such renewals became necessary." After dealing further with this matter, the Board remark that section 133 appears to permit the reserve fund to be used for the purpose of capitalizing profits to the extent of about £50,000 a year in the application of moneys in the fund to extensions and new works; and they add that "the Company have taken large advantage of the privilege during recent years." A table is given showing the actual transfers and the excess in certain years over the limit of 3 per cent.—the amounts appropriated for specific reserves being added to the reserve fund appropriations. Though it is shown that the Company have transferred amounts in excess, the Board point out that the money might have been paid away in dividends without affecting the price of gas under the sliding-scale provisions contained in section 134 of the Act.

It was urged on behalf of the Company that the course followed by the Directors in providing for works reconstruction was, in the circumstances, the most prudent—that it was in accordance with the ordinary practice of companies unfettered by special legislation in this regard. The Board acknowledge that the expenditure on the work was undoubtedly necessary; but they say the method followed in making the provision was not in accordance with the scheme of accounts and the provisions of section 133, and did not show to prospective purchasers the Company's true net profits. The Company's view is that these special reserves are merely undivided profits, and applicable for any of their purposes; and that no limit is imposed as to the extent and application of these profits. The Board say, if this view is correct, Parliament has failed to place any restriction whatever upon the accumulation of reserves; and the Company are at liberty to build up internal reserves under any name, to any amount, and for any purpose. They, however, think these reserves are not merely undivided profits, but are set aside out of profits.

Dividends.

When the Bill for the amalgamation of the three Companies was under consideration by the Select Committee in 1877, 10 per cent. was considered to be a reasonable dividend on the capital; and a sliding-scale, based on the price of gas, was recommended by the Committee and adopted by Parliament. Accordingly, 10 per cent. was fixed as the standard with a maximum price of 7s. 6d. for the first five years, and 7s. after the expiration of this period, with an increase of 5s. of dividend for each reduction of 1¼d. per 1000 cubic feet in price. The views of the promoters' witnesses were that the dividend was to increase 5s. per annum for every decrease of 1¼d.; but the Company have read the section 134 of their Act, which bears upon the matter, as permitting them to declare an increase of 5s. per half year for every reduction to the extent named. This interpretation enables them to pay a dividend of 19½ per cent. on a selling price of 5s., and of 21½ per cent. on a price of 4s. 7d. The Board say the weight of evidence before them favoured 10 per cent. as a reasonable dividend. The Chairman of Directors stated that the 10 per cent. paid by the Company gave a return of about 5 per cent. on the market value of the shares, and with an increase of dividend this value rose in proportion. In the opinion of the Board, this indicated that investors were satisfied with a 5 per cent. return. On the present cost of production, the Board think it is evident that the dividend allowed under the Company's Act is unreasonable, in view of the selling price of gas. With the exception of the eleven years 1881 to 1891, the Company have not paid the maximum dividend permitted in relation to the price charged for gas. In order to bring the Company's sliding-scale into line with that of gas companies in the United Kingdom, the Board consider that the rate of variation in the price should be altered from 1¼d. to 1d. per 1000 cubic feet for each increase or decrease of 5s. per cent. per annum in the dividend. The sections of the Act relating to the limits placed on reserves, the sliding-scale, the maximum price, tests of meters, and quality of gas, are, they say, the only protection the Act affords to consumers.

The Question of Municipalization.

The provisions in regard to municipalizing the Company's undertaking are contained in section 249 of the Act, in which it is laid down that the terms of purchase are to be "18 years' purchase of the annual net profits, estimated on the average of the three then next preceding years," or upon such other terms as may be mutually agreed upon. In the draft Bill submitted by the promoters in 1877, the purchase price was to be 25 years' purchase of the annual divisible profits, estimated as above set forth. The Municipalities insisted on 17 years' purchase of the divisible profits; and the Company were willing to consent to 20 years. The Select Committee altered the clause to 18 years' purchase of the annual profits; and the section as passed contained the word "net" before "profits." The view presented to the Select Committee by the promoters' witnesses was that the words "annual divisible profits" were intended to mean profits annually distributed in dividends. The section involves the following difficulties of interpretation: (1) Is interest payable on debentures to be deducted before arriving at the net profits? (2) Is the debenture liability transferred to the purchaser? (3) Do the words "three next preceding years" refer to the time of notice or of payment—*i.e.*, is the year of notice to be taken as one of the three years of which the net profits are to be taken into calculation? (4) Are the Municipalities bound to purchase, having once given notice of their intention to do so? The Municipalities have been deterred by these difficulties, among others, from entering into negotiations for purchase. The three most important questions affecting the amount of the purchase-money are, the Board consider, these: (1) Is the debenture interest to be deducted in order to arrive at the net profits—the debenture liability passing to the purchaser? (2) Is the interest not to be deducted—the Company retaining the liability? (3) Is the interest to be deducted, and the Company to retain the liability? They are of opinion that section 249 means that the interest is to be deducted before arriving at the net profits, and that the vendors remain liable for the debentures. They regard this interpretation of the section as being the most favourable to a purchase by the Municipalities, as it means that, on the past three years' profits, the undertaking could be acquired by them for £2,955,636. Assuming that the Corporations could borrow at 4 per cent., and would provide 1 per cent. for a sinking-fund, the capital to be invested would carry an annual outgoing of £147,782, against £120,181 paid by the Company as dividend at 10 per cent. and debenture interest. The Company would receive £2,955,636, out of which they would liquidate their debenture liability of £857,000—leaving available for the shareholders £2,098,636, equivalent to £12 4s. 10d. per share. The Company's share capital liability is £857,210; and the present market value of the £5 shares is £9 10s. The Board's interpretation of the section renders the purchase proposition a most difficult one to accept; but the other interpretations would, they say, "make it impossible for the local authorities to purchase the undertaking for a sum equal to 18 years' purchase of the net profits, to carry it on successfully, and to supply gas at a reasonable price." They consider the advisability of the acquisition of the undertaking by the Municipalities on a fair and equitable basis, is unquestionable; but, in their opinion, the basis set out in section 249, on any of the suggested interpretations, "results in a price which, in the circumstances, is unreasonable." If this basis is to remain, it is suggested that Parliament should declare its meaning, as there has been much controversy regarding the interpretation of the section. But the Board think that the Act should be amended to provide for purchase by arbitration; and they consider Parliament would be justified in doing this, "provided that a fair and reasonable return for money invested is secured to the shareholders."

Production, Distribution, and Price of Gas.

The Board next proceed to consider the conditions affecting the cost of production and distribution of gas, and the reasonableness or otherwise of the price charged to the consumers. They begin by pointing out that the conditions affecting the cost and price are: (1) Annual capital charges; (2) net cost of manufacture, distribution, and management; (3) appropriations of profits to reserve and other funds. The price of gas per 1000 cubic feet in Melbourne at the close of the inquiry was: For lighting and heating, 5s. by ordinary meter, and 5s. 6½d. by prepayment meter; for power, 3s. The charge for lighting and heating is stated to be approximately 100 per cent. more than the average price ruling in the United Kingdom. In Sydney, the prices are 3s. 9d. for lighting and heating, and 3s. for power; and there is an additional charge of 1s. 2d. for prepayment meters. It was contended, on behalf of the Company, that the higher price in Melbourne, as compared with the charges in Sydney and the United Kingdom, is due, in the first place, to the smaller consumption of gas (relatively to the capital employed in the undertaking) and the length of mains; and, secondly, to the higher costs for coal and labour. Taking the first of the four conditions above mentioned, the Board remark that the

* See "Journal," Vol. LII., p. 1023; and Vol. CXV., p. 433.

amount of capital employed affects the cost of production and the price of gas only so far as it affects the annual capital charges. They give an analysis of these, and show that, on last year's sale of gas, they came to 1s. 2·08d. per 1000 cubic feet, compared with figures ranging from 11·31d. down to 7·10d. for the three London and four other English Companies. It was proved that the price of coal is higher in Melbourne than in the United Kingdom or in Sydney; and so are wages. But the Board point out that the cost of coal to the Melbourne Company is considerably reduced by the high price received for residuals; and they say the net cost compares favourably with that to companies with which comparisons can be made.

Some comparative statistics of the cost of production are given, the summary of which shows that while the Melbourne Company are at a disadvantage to the extent of 1s. 3·25d. per 1000 cubic feet in capital charges, manufacture, distribution, and management, they have an advantage of 2s. 3·46d. in revenue; so that there is a net advantage of 1s. 0·21d. Last year the Company set aside out of net profits £104,500 for the reserve fund, the meter renewal fund, and the gas-stoves and reconstruction accounts, and there was a sum of £12,204 unappropriated—making together £116,704, or equivalent to 13·33d. per 1000 cubic feet, compared with figures ranging from 2·12d. down to 0·10d. for English companies. The Board say the high figure in the case of Melbourne accounts for a difference of 11·67d. in the price, as compared with that charged by the Australian Gas Company, and of 10·67d. in that of the Auckland Company. It is pointed out that the reduction of appropriations, &c., for the future to 2·66d., as in Auckland, assuming that the total working expenses, &c., remained at the same figure, would alone make possible a reduction of 10½d. in the price.

On the subject of the price of gas supplied through prepayment meters, the Board remark that the Melbourne Company may make an additional charge of 6½d. per 1000 cubic feet. They say the introduction of the system has been a great convenience to small consumers, who have the advantage of a gas supply without initial cost. They point out that the additional charge covers only the fair interest and depreciation on the value of the fittings supplied with the meter. Some objection was raised to the extra charge; but the Board consider it is "fair and legal." They think, however, that the attachments should be tested, and the Company's Act amended to prescribe a method for the purpose.

The Board next make the following remarks in connection with this section of their inquiry:

The capital expenditure of a gas undertaking in Victoria is naturally larger than that of a similar undertaking in the United Kingdom, because a large proportion of the plant is imported, and all costs associated with the erection are higher. The facts set out also show that the Metropolitan Gas Company, in regard to its working expenses and net coal charges in 1911, was at a disadvantage of 15·25d. per 1000 cubic feet as compared with English companies. This is chiefly due to the higher charges for net coal and for labour.

But two other factors also influence the present costs. One is that the Company has its works at West Melbourne, South Melbourne, and Fitzroy. For some years the establishment of central works, which would permit the closing-down of the West Melbourne and Fitzroy works has been under consideration by the Directors. The Engineer of the Company, in comprehensive reports, has directed the attention of the management to the necessity for this concentration, for the following reasons: (1) To meet the rapid increase in the demand, calculated by him at 10 per cent. compound. (2) The reduced cost of carbonization, with all-round economies and higher efficiency. (3) The inadequacy of the area of the present works for extensions and coal storage. The other factor in the costs is the appropriation for reconstruction purposes already referred to. The charges for these have been exceptionally heavy during the past two years; but the Company, by installing a modern plant of vertical retorts and by rearranging its works, will materially increase the output per ton of coal, and will very greatly reduce the manufacturing cost—thus permitting a large reduction in the price of gas.

The following statement shows that, with the exception of £33,211 charged to capital, the whole cost of reconstruction to Dec. 31, 1911, was borne by revenue:—

	Chargeable to Revenue.		Chargeable to Capital.
Expenditure to Dec. 31, 1911 . . .	£86,920	..	£33,211
Provisions unspent on above date. .	25,580	..	—
Balances to be provided after ditto .	12,075	..	108,514
	£124,575	..	£141,725
Total	£266,300		

The expenditure on reconstruction was necessary to maintain and extend the productive capacity of the works. The decision of the Directors to enter into commitments for large expenditure at West and South Melbourne, and their failure to realize the pressing necessity for central works to meet the rapidly increasing demands of the Metropolis will have the effect of keeping gas in Melbourne at a high price for a number of years.

It is advisable that a new site should be acquired for the gradual concentration of the works, not only to meet the growing demand, but also to reduce the unusually high cost of production in Melbourne as compared with that of other great cities, and that facilities should be afforded to the Company to acquire a suitable site for this concentration.

The continuance of three establishments conduces to excessive expenditure without any compensating advantage. The Fitzroy works are a special cause of loss to the Company. The cost of cartage of coal alone adds nearly 3d. per 1000 cubic feet to the manufacturing charges at Fitzroy. The Fitzroy works should be closed, and central works established to replace these and the West Melbourne works, and provide for the rapidly increasing demand for gas, which, with a reasonable charge, would still more rapidly increase.

Allowing for a saving of only 2d. per 1000 cubic feet by improved methods of carbonization, and allowing for a dividend of 10 per cent., we are of opinion that 4s. per 1000 cubic feet is a reasonable price. We are also of opinion that the standard price of gas should be periodically revised in accordance with the circumstances controlling the cost of manufacture and other charges incidental to the gas supply.

General Observations.

In dealing, generally, with matters relating or incidental to the supply of gas within the Metropolitan area of Melbourne—the concluding section of the subject of their inquiry—the Board offer the following observations.

Experience in the United Kingdom proves that gas undertakings can be most successfully controlled by municipalities. The latest returns show that 298 gas-works are municipal undertakings, and 511 are controlled by private companies. The average price of the gas sold is 2s. 6d. in the case of the municipalities and 2s. 9d. in the case of the companies. The lower price charged by the municipalities has been attributed to the situation of works near coal mines, and the consequent lower cost of coal. "Field's Analysis" of the accounts of principal gas undertakings for 1911 shows the average net cost for coal to the companies to be 3·32d. per 1000 cubic feet, and to the municipalities 3·71d. per 1000 cubic feet.

A special feature of municipal ownership is the provision of sinking-funds for the gradual reduction of the capital liability, and, consequently, of the annual charges—thus enabling these undertakings to reduce the price of gas. Under company management, the shareholders' demands for dividends tend to prevent appropriations for the reduction of capital liability. Statutes regulating gas companies make no provision for redemption or sinking funds, while those regulating municipal undertakings insist on such provision.

Gas undertakings are a most suitable field for municipal enterprise, with advantages both to ratepayers and consumers; and there are no features of the Metropolitan Gas Company's undertaking which make it an exception to this proposition. The municipalization of all gas-works within the Metropolitan area must eventually result in a reduction of the price of gas.

The only satisfactory alternative to municipalization is strict regulation of private companies by legislative enactment on the principles of the Model Gas Bill (1910) of the Board of Trade of the United Kingdom.

Gas is subject to serious competition from electricity, more particularly for light and power. Electricity has made rapid advance in the Metropolitan area during recent years. Although electricity may predominate for light and power, there is room for gas development, especially in the event of a reduction in price, which would result in an enormous increase in demand, especially for heating purposes. A valuable report by the City Electrical Engineer (Mr. H. R. Harper) shows that gas has maintained its position with respect to street lighting in London districts. For gas street lighting at its best he instances Berlin, where the undertaking is municipal.

Much evidence was placed before the Board as to the comparative cost of the rival illuminants. But from this the Board has been unable to reach a satisfactory conclusion. A substantial reduction in the price of gas would give this illuminant a great advantage in the competition. The introduction of the incandescent mantle has most materially assisted gas in its competition with electricity. With the universal adoption of these mantles, the standard of illuminating power may be lowered, with a consequent reduction in the cost of production and of price. In the United Kingdom, the standard quality in some cases has been reduced; but, as a rule, when legislative authority has been sought for a reduction in the standard quality, a reduction in the standard price has been insisted upon.

The quality of the gas supplied by the Metropolitan Gas Company is according to the prescribed standard. The usual British standard is 14-candle power. We think that the use of mantles for lighting, and the large and increasing use of appliances for heating, warrant the reduction in the statutory standard of illuminating power from 15 to 14 candles. According to British practice and legislation, a reduction from 15 to 14 candle power involves a reduction of about 1d. in the standard price.

Some representatives of municipalities favoured uniformity in the price charged for street lighting. Competition between gas and electricity for street lighting unhampered by uniform prices is, we think, advantageous to the local authorities. Others advocated the erection of municipal gas-works to compete with the Metropolitan Gas Company. Such a course would be most disadvantageous, unless the acquisition of the Company's undertaking on fair and reasonable terms proves to be impossible.

The question of the reliability of meters was carefully investigated; and on the evidence it would appear to be hardly possible for a properly constructed and tested meter to register against the consumer. The Company's Act (section 222) provides that no meter shall be allowed to remain in use for more than ten years without being re-tested and re-stamped in the manner provided by the Act. The Company recognizes the necessity for a more frequent examination of the meters, and its practice is to bring them in for testing every seven years. Complaints are continually being made by consumers as to the incorrectness of their meters and of the reading by the Company's collectors. The appointment of inspectors by the Gas Conference, to test meters occasionally and take independent readings, might tend to alleviate this ever-present trouble.

The following are the Board's

Findings and Recommendations.

We find that the Metropolitan Gas Company has in the years 1888, 1889, 1908, 1909, 1910, and 1911, set aside out of profits carried to the reserve fund amounts in excess of the limit of 3 per cent. on the combined amount of the paid-up capital of the Company and of the principal sums secured on the undertaking and revenues of the Company for the time being; but such amounts in excess did not affect the price of gas as determined by the sliding-scale. The Company has not at any time permitted its reserve funds to exceed a sum equal to one-eighth of such combined amount. The practice of the Company in transferring profits from the net revenue account to accounts to meet contingent liabilities, such as works reconstruction account, resulted

in the true net profits of the Company not being disclosed to possible purchasers. The Company may not set aside out of profits sums in lieu of depreciation, or for any other purpose (except for depreciation of works on leasehold lands), in excess of the limits imposed by section 133. The Act permits undivided profits to any amount to be carried forward from year to year. Ten per cent. per annum is a reasonable rate of dividend, in view of the price of the shares. The maximum price (7s. per 1000 cubic feet) regulating the payment of dividend is excessive. The Company's interpretation of the sliding-scale section of its Act is correct. The sliding-scale section of the Act enables the Company to pay dividends which are unreasonable, in view of the selling price of gas. The present price charged by the Company for lighting and heating is unreasonable.

We recommend that action be taken to restrain the Company from transferring profits in any year to reserves in excess of the sum permitted by section 133 of its Act; section 133 be repealed, and new sections substituted, as suggested; the standard rate of dividend be 10 per cent.; and that the Act be amended to provide as follows: For every decrease of 1d. per 1000 cubic feet below the standard price the Company may increase its rate of dividend by ¼ per cent. per annum, and for every increase of 1d. per 1000 cubic feet the Company shall reduce its rate of dividend by ¼ per cent. per annum.

Section 249 of the Company's Act to be repealed, and a section enacted providing for the acquisition of the undertaking by the Municipalities upon giving six months' notice to the Company of their intention to purchase, and the price to be fixed by mutual agreement or by arbitration. The standard price of gas be 4s. per 1000 cubic feet, and be subject to periodical revision. The Company's undertaking to be acquired by the Municipalities. All private companies supplying gas in the Metropolitan area to be subject to regulation by a Gas-Works Clauses Act on the lines approved by the Board of Trade in the Model Gas Bill (1910). The Metropolitan Gas Company to be permitted to reduce the illuminating power of gas from 15 to 14 candles, provided that an appropriate reduction in the prescribed price of gas is made.

At the close of their findings and recommendations, the Board submit their scheme (which is here epitomized) of

SUGGESTED LEGISLATION.

Dividend and Price of Gas.—The standard rate of dividend to be 10 per cent. per annum, and the standard price 4s. per 1000 cubic feet, with a sliding-scale of 5s. per cent. increase or decrease of dividend with a reduction or an advance of 1d. or a fraction of 1d. per 1000 cubic feet in the price.

Special Purposes Fund —The Directors are to be authorized to appropriate, out of the expenditure on revenue account in any year, a sum not exceeding 1½ per cent. of the paid-up capital of the Company, excluding premiums, for the creation of a special purposes fund, to be applicable only to meet such charges as the Auditors appointed by the Governor in Council and the Local Authorities under the provisions of the principal Act shall approve. The fund is not to exceed one-tenth of the paid-up capital, excluding premiums. The moneys or securities standing to the credit of the reserve fund and the meter renewal fund of the Company at the time of the passing of the proposed Act are to be credited to the special purposes fund.

Limitation of Profits Carried Forward.—If the profits in any year amount to a larger sum than is sufficient to pay the dividend at the standard rate, the excess is to be carried to the credit of the divisible profits for the following year; but the sum so carried forward is not in any case to exceed the amount required to pay one year's dividend at the standard rate.

Reserve Fund.—Authority is given to form a reserve fund, to be applicable to the payment of dividend whenever the profits are insufficient for the payment of the standard rate.

Purchase of the Undertaking.—Power is to be conferred on any local authority or authorities to purchase the Company's undertaking on giving six months' notice in writing of their intention to do so. The amount of the purchase-money and the terms and conditions of purchase are to be those agreed upon, or, in the event of disagreement, to be settled by a single arbitrator, either selected by the parties or appointed by the Governor in Council. The amount of the purchase-money is not to be greater than—(1) the sum by which the value of the assets exceeds the liabilities; (2) a sum equal to a dividend of 10 per cent. per annum on the paid-up capital of the Company for the three years next preceding the date of the notice of intention to purchase; and (3) the sums set aside within the period named to the reserve fund under section 133 of the principal Act, and to the special purposes and reserve funds under the provisions of the proposed Act. It is suggested that the undertaking, and all the rights, powers, and privileges of the Company and all their assets shall be transferred to, and vest in, the purchaser as from a date not being later than one month from the date of the award to be fixed by the arbitrator; and the purchaser is within six months of the latter date to pay to the Company the amount of the purchase-money, together with interest at the rate of 5 per cent. per annum on any unpaid balance.

Wolverhampton Municipal Undertakings.—Dealing with the finances of the borough at the monthly meeting of the Wolverhampton Town Council, Alderman Johnson expressed the opinion that they were justified in taking an optimistic view of matters. With regard to the Corporation's four commercial undertakings—the tramways, electricity, water, and markets—the capital expenditure to March last was £995,740, the sinking fund contribution £20,050, and renewals, depreciation, and reserve £14,062. There had been £13,767 paid in aid of the rates for 1912-13, and the total profit for the year was £75,533. The outstanding debt was £745,262, and the gross profit for last year was equal to 7·6 per cent. on the capital expenditure. Though the rates were not going down in the way they would like, they had done a great deal of municipal work which many other corporations had still to do. Their commercial undertakings were doing extremely well, but they would still have to ask the long-suffering ratepayers to be a little indulgent.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

Half-Yearly Report.

At the Half-Yearly General Meeting of the Association on the 5th prox., the Directors will present the following report, which is accompanied by the accounts, on the results of the Association's operations in the six months ended the 30th of June.

The profit of the half year was £248,008 12s. 1d., which, together with the sum of £58,899 11s. 8d. brought forward from the previous half-year's account, makes a total of £306,908 3s. 9d. available for appropriation, as compared with a profit of £281,767 9s. 6d. and an available total of £308,045 12s. 9d. on June 30, 1911. The reduced profit is principally due to the loss of the Vienna station, which was taken over by the Municipality from Dec. 31, 1911.

The Directors recommend a dividend for the half year ended the 30th of June of 4½ per cent., less income-tax.

The total output of gas in the various towns directly supplied by the Association during the half year showed an increase at the rate of 5·26 per cent.; and the number of consumers increased at the rate of 8·57 per cent.

The total number of meters in use at the close of the half year was 540,525, of which 158,588, or 29·34 per cent., were prepayment meters. At the end of June, 1911, the total number of meters (including 45,527 at Vienna) was 550,447, of which 145,008, or 26·34 per cent., were prepayment meters.

Seventy-three miles of new mains were laid in the course of the half year under review; but 355 miles of mains having been acquired by the Municipality of Vienna, the total mileage on the 30th of June last amounted to 2198, or 282 miles less than on Dec. 31, 1911.

The plant and mains at all the stations were maintained in their usual efficient condition.

The quantity of coal carbonized in the half year was 464,715 tons, of which the average gross cost was 17s. 9·52d. per ton, or 7·52d. more than in the corresponding half year. The value of coke was lower than in the corresponding half year; but the values of tar and ammonia products continued to improve.

The Directors regret to report that, after negotiations extending over a period of years, the Town Council of the City of Aix-la-Chapelle, where the Association had provided the gas supply since 1838, decided, in May last, by a majority of 19 votes to 17, to purchase the works on the expiration of the Association's concession on the 30th of June. An agreement having been come to by which the Town Council consented to pay the Association a reasonable price for the works and mains, &c., the business of the gas supply in this town and in its suburbs was duly taken over by the Municipality on the 1st of July.

At Antwerp, progress was made with the erection of six furnaces, of 18 five-metre vertical retorts each, on the Berehem works, and with the construction, on the Hoboken works, of two sets of water-gas plant with a capacity each of 750,000 cubic feet per day.

At Berlin, contracts were secured with the suburban communes of Schönefeld and Wassmannsdorf for the exclusive supply of gas until 1971 and 1961 respectively. Progress was made with the construction of additional settings of vertical retorts on the Mariendorf and Weissensse works.

Contracts were concluded, until 1962, with the communes of Arnemuiden and Nieuwen St. Joosland, situated in the Island of Walcheren, for an exclusive supply of gas from the works at Flushing.

At Hanover, exclusive contracts for the supply of gas to the suburban communes of Bemerode, Empelde, and Lagenhagen, were concluded for 38 years (until 1950), and further progress was made with the construction of the new gas-works situated in the Linden district.

DANISH GAS COMPANY.

Annual Report.

At the annual meeting of the Danish Gas Company on Thursday, the Directors will report that the net revenue for the year to June 30 last is £77,480; being an increase of £6607 over that of the previous year. Adding the amount brought forward from the last account, the total credit to the profit and loss account is £120,297. After charging the debenture interest and loss on exchange, and setting aside £15,000 to the reserve and redemption account, there remains £94,812 available for distribution. An interim dividend of 2½ per cent. on the preference shares and 4 per cent. on the ordinary shares has already been paid; and the Directors now recommend that there should be declared a dividend of 2½ per cent. on the former and 5 per cent. on the latter shares, both free of income-tax. They further recommend the payment of a bonus of 1 per cent., free of income-tax, upon the ordinary shares. These dividends and bonus will amount to £43,500, and will leave a balance of £51,312 to be carried forward. The amount charged to capital account during the year, for additional lands, buildings, apparatus, mains, &c., is £19,032. The expenditure has been principally at Flensburg and Hörsholm. A supplementary contract has been arranged with the authorities at the former place, whereby the present concession is extended to Jan. 1, 1925. A thirty years' contract for the exclusive supply of gas to St. Hans, a district adjoining Odense, has also been arranged with the local authorities. The work in connection with this supply has been commenced.

Accompanying the Directors' report is that of the Engineer (Mr. A. W. Edwards), which furnishes the following particulars: The total consumption of gas in the year to the 30th of June was 1,076,867,000 cubic feet, against 1,095,208,000 cubic feet in the previous year; showing a decrease of 18,341,000 cubic feet, or 1·67 per cent. This is accounted for by the loss of Aalborg. The remaining stations show an increase amounting to 40,811,000 cubic feet, or 3·94 per cent. At Flensburg, the new district of Klues, mentioned in the Engineer's last report, is now supplied from the gas-works; and a new 700,000 cubic feet gasholder is being erected. At Odense, a new district (St. Hans) has been secured. The population is now upwards of 5000, and is

increasing. The building of a new retort-house at Elsinor, also mentioned in the last report, has been postponed. The washer plant is being extended, and an ammonia plant from the Frederiksberg station is being fixed. The Viborg station is in good condition with regard to productive capacity, and will not need extension for some years to come. The carbonizing plant at Assens has been remodelled, and the exhauster plant is being extended. A new retort-house with vertical retorts is being erected at the Strandvei works, a new boiler-house and plant is being built, and a trunk main will shortly be laid from the works to the district. The erection of a new overground steel tar-tank has been completed. The washer plant at Frederiksberg is being extended. Two new centrifugal washers are being erected, and will be taken into use before the winter. A new tank for a gasholder of a million cubic feet capacity is being built. The new boring at Tikjöb and Asminderöd-Grönholt, mentioned in the last report, has been completed, and the water-works are now able to give an ample supply of good water. A new gasholder has been erected at Hörsholm, and has been taken into use. New borings for water for the water-works are under consideration. A uniform price of gas has been introduced at Ribnitz. A large portion of the gas-mains has been stripped, and a considerable number of leakages found and stopped. The prices for coke, tar, and ammonia have been satisfactory. All necessary alterations and repairs have been carried out or are making good progress; and Mr. Edwards says the stations will be in good working order for the winter.

MOTOR FUEL FROM GAS-WORKS.

In last week's "JOURNAL," reference was made to an article that had recently appeared in the "Autocar," as also to an interesting and suggestive letter written by a firm of benzol manufacturers, who advocated the use of this spirit for motor-cars, and suggested that gas-works should form themselves into a ring of depôts in order to provide the public with facilities for obtaining the spirit. In the number of our contemporary for the 12th inst., Mr. Alwyne Meade, Assoc. M.Inst.C.E., points out why, in his opinion, the proposal is impracticable at present.

There is little doubt, he writes (and the letter from the Mitchell Main Colliery Company dissolves all doubt), that benzol, when used with an extra air-valve to the carburettor, provides the motor-car user with an admirable and efficient fuel; the difficulty at present being that it is almost impossible to obtain supplies except in the neighbourhood of works which manufacture the spirit.

Benzol, as is well known, is a spirit the supply of which is entirely dependent upon the gas-works—not that it is only recovered on gas-works (this being far from the case); but it is one of the most valuable products recovered from gas-works tar. The tar is distilled, and at certain temperatures various distillates are given off in the form of gas, the vapours passing through cooling apparatus, which throws them down in liquid form. The order in which the various products are evolved, and the approximate amount obtained of each are as follows:

One thousand gallons of tar yield:

(*a*) Ammoniacal liquor	25	gallons.
(*b*) First light oils	28	,,
(*c*) Second light oils	131	,,
(*d*) Creosote oils	87	,,
(*e*) Anthracene oils	191	,,
(*f*) Pitch	3¼	tons.

If the first light oils (*b*) in the above table are again treated, they will yield about 6 gallons of 90 per cent. benzol. For the production of benzol, therefore, it is only these oils which are of value.

With regard to the suggestion that gas-works should provide benzol depôts, the writer—a gas engineer—would like to point out why the proposal (excellent as it is) is entirely impracticable from the gas-works point of view at the present time.

Firstly, there are some 1600 gas-works in the United Kingdom; and of these probably less than 2 per cent. work up their tar, and, consequently, produce benzol. Taking the great Metropolitan gas-works, in all, the three London Companies have as many as seventeen works; and of these there are only two which have facilities for distilling tar, and, therefore, for manufacturing the spirit in question. The remainder of the tar in London goes for road-coating and other purposes, though many of the works sell it to tar distillers, who could no doubt produce benzol in fairly large quantities.

As far as London is concerned, however, there should be a plentiful supply of benzol for motorists; but at the majority of gas-works in the country and in medium-sized towns benzol is an almost unheard-of substance. True, it has been suggested that gas-works use this for enriching purposes, and also for treating pipes which have become furred-up with naphthalene. In both cases, however, the extent to which it is now used is so small as to be almost negligible; for, as an enriching agent, benzol has been almost entirely superseded by carburetted water gas, and with regard to naphthalene, modern methods of carbonization and modern ideas of naphthalene washing—for which paraffin is largely used—have made this gas-works "bugbear" practically a thing of the past.

In the case of carburetted water gas, the enriching agent employed is not benzol, but a heavy mineral oil (sp. gr. ·85) of the paraffin type, chiefly coming from Russia and bought in bulk for about 2d. per gallon. Moreover, the carburetted water gas itself provides a solvent for naphthalene.

In larger provincial towns, such as Birmingham and Liverpool, it should be quite possible to obtain benzol, for here there are large gas-works from which a quantity of tar is produced.

It might, perhaps, be asked why gas-works do not more generally make up their tar and recover the benzol. The reply is that from 1000 gallons of tar it is only possible to extract 6 gallons of benzol, and before it becomes profitable to distil tar for the sake of recovering the benzol alone there must be a far greater demand. Moreover, gas engineers must first be satisfied that the demand, when it comes, will be continued, and that the popularity of the spirit will not wane after the expensive apparatus for recovering it has been installed.

At present, the price of benzol when bought in fairly large quantities, not less than a cask (40 gallons) at a time, is about 11d. per gallon. Thus, even if an additional 2d. per gallon was added to the price, the spirit would still prove a formidable competitor with petrol.

MANCHESTER STREET LIGHTING EXPERIMENT.

The "Journal" Criticism—Views of the Chairman of the Gas Committee.

The editorial criticism of the street lighting experiment that appeared in the "JOURNAL" last week was reprinted in the "Manchester Evening News" on Wednesday; and subjoined was the following statement recording the views of Mr. Councillor Kay, the Chairman of the Corporation Gas Committee.

Seen by our [the "Manchester Evening News'"] representative today, on the above question, Mr. Councillor Kay, the Chairman of the Manchester Gas Committee, said he agreed with the article in its entirety. He pointed out that it was perhaps a little unfair, at the present juncture, to compare the gas display with that of electricity, because the experimental central gas plant was hastily constructed; and it was not possible, as a consequence, to get the best results. There was no doubt that London was in a better position than this city, as regards high pressure; but it was anticipated that this defect would be speedily remedied.

With regard to the gas-lamps in Princess Street, he contended that the light given from them was much superior to the "great glare" coming from the electric arc lamps in Portland Street. The aim of the Gas Committee was to get a light which was as near to daylight as possible, and not a blaze. "We don't want a street like a fair ground," he added. "We also want to give the ratepayers of Manchester the best value for their money. Personally, I welcome the formation of a Lighting Committee."

Mr. Kay also commented on the haze which was always to be found round the electric arc lamps in Portland Street, and said that they did not compare favourably with the light given by the gas-lamps. The latter, he added, was not injurious to the eye, which was more than could be said for the electric light.

Next day the following further remarks appeared in the columns of the "Manchester Evening News":

With regard to the criticisms in yesterday's "Evening News" relating to the street lighting experiments, Alderman Walker, a member of the Electricity Committee, suggests that, as the report of the two experts (Mr. Abady and Mr. Harrison), appointed by the Gas and Electricity Committees respectively, had been received, and would shortly be submitted to the City Council for discussion, it would have been better not to prejudice the matter by making *ex-parte* statements at this stage. At a very early date, the public would have every opportunity of contrasting the considered opinions of these two experts with the remarks made by the "JOURNAL OF GAS LIGHTING," and would be able to form their own opinion of the criticisms that have been offered.

[Comment on Alderman Walker's views are made by us on p. 274.]

PUBLIC LIGHTING OF HAMPTON.

A Ten-Year Gas Contract.

The Hampton Urban District Council have unanimously adopted a recommendation of the Lighting Sub-Committee that they should enter into a ten years' contract with the Hampton Court Gas Company for the public lighting; and several members spoke highly of the new scheme offered by the Company, and the saving to be effected by it.

As the result of correspondence and an interview with the Engineer (Mr. W. E. Price) the Gas Company had, the Committee stated, submitted a proposal which would result in an annual saving of about £140, with an initial capital expenditure of about £46 5s. only, by two half-yearly payments. The terms, which were offered by the Company on condition that the Council entered into a contract with them for ten years, are: (1) The Company to provide and fix at their own expense, and maintain, automatic controllers for lighting and extinguishing each of the street-lamps. (2) The Company to provide and fix, at an expense of 2s 6d. each lamp, to be paid by the Council, and estimated at £46 5s., inverted burners to consume 3½ cubic feet of gas per hour, bye-passes, No. 3 mantles, and glass protectors, and afterwards to maintain the same during the period of the contract. (3) The price to be paid by the Council (together with a comparison of the price paid under the former contract) is as follows: For each single burner consuming 3½ cubic feet per hour without bye-pass, new price per lamp per annum, £2 15s. 3d.; former price, £3 2s. 6d.—saving, 7s. 3d. The present number of burners is 370. (4) In case of any alteration in the price of gas during the period of the contract, there shall be an automatic rise or fall of 1s. 3d. per lamp per annum for each penny rise or fall in the price of gas charged to private consumers. (5) The Company to repair, light, and extinguish the lamps. The time for lighting is to be 45 minutes after sunset, with the exception of April to July, when the period is 60 minutes. The time for extinguishing is 60 minutes before sunrise, with the exception of November to February, when it is 30 minutes. (6) If the Council, at any time during the continuance of the contract, desire to alter the hours during which the lamps shall be alight, they are to be entitled to an adjustment of price at the rate of 2s. 9d. per 1000 cubic feet of gas consumed—each burner being calculated to consume 3½ cubic feet per hour.

The Committee still had under consideration a possible further saving by a revision of the hours of lighting, but were not yet prepared to report thereon.

PUBLIC LIGHTING QUESTION AT CHATHAM.

"Extravagant" Electricity Scheme Adopted for the High Street.

At the last Meeting of the Chatham Town Council, the Highways and Works Committee submitted a scheme for lighting the High Street by electricity in the place of the existing gas-lamps; and it led to an animated discussion. The Kent Electric Power Company and the Rochester, Chatham, and Gillingham Gas Company had erected trial lamps, and they had been inspected by a Sub-Committee, who had had before them a report by the Surveyor. In the course of this, it was stated that the cost of gas lighting at the present time is £214 10s. 5d. per annum for 29 lamps; and the Company proposed to increase the number to 46, half to be large lamps with 24-feet burners, and the other half to be small lamps with 12-feet burners—the small lamps to be placed alternately with the large ones, and to be kept alight the same number of hours and maintained as is done at the present time at the estimated capital cost for supplying the lamps, columns, fixing, &c., of £280, and an annual charge for gas and upkeep of £393. The Electric Power Company proposed to employ 23 600-candle power metallic filament lamps, 11 to be turned off at midnight, for £450 per annum; the capital expenditure for fixing the lamps being £357, less the value of the columns (say, £3 10s. each), £101 10s., or £255 10s. The Sub-Committee said these figures showed that the difference in annual cost between gas and electric light was £57 against the latter, but in capital expenditure it was £24 10s. against the former. As the result of a careful consideration of the figures, they recommended the adoption by the Council of the Electric Power Company's proposal, subject to the Company giving an option of renewing the contract, "on the same or better terms," after the expiration of seven years. The Committee adopted the report, and at the meeting of the Council Alderman Skinner, the Chairman of the Committee, moved the confirmation of the recommendation.

Alderman H. F. Whyman moved, as an amendment, that the whole matter should be referred back to the Committee for further consideration. He said that up to Dec. 31 last the Council were paying £161 per annum for lighting the High Street; but by the proposed arrangement it would be £465. Under the increased cost for gas, the amount would be £215 a year for the High Street, if they adopted gas lighting. But for electricity the cost would be £357 for fitting up the light on a seven years' agreement; and it was also proposed to pay £450 a year for the supply of electricity. This meant an increase of £250 a year on the present arrangement. He characterized the recommendation as an extravagant scheme, and said the promoters had "run over themselves" in order to get it through.

The amendment was cordially seconded by Mr. J. J. Acworth; but after much discussion it was defeated by 12 votes to 8. The Sub-Committee's recommendation was then confirmed, with the addition of the words, proposed by the Mayor (Alderman E. A. Billinghurst), "subject to a formal contract being approved by the Council."

CHEAP GAS AND ELECTRICITY AND SMOKE ABATEMENT

Suggestions by the Manchester Smoke Abatement League.

The Special Committee appointed by the Manchester City Council more than a year ago to investigate and report upon the question of contributions from the trading Committees of the Corporation in relief of rates, met last Wednesday after an interval of some six months. A deputation from the Manchester and District Smoke Abatement League, including Mr. E. D. Simon, the Chairman, attended for the purpose of emphasizing the point that by a cheapening of gas and electricity much would be achieved in the way of smoke abatement through increased consumption for heating and power purposes.

Sir Charles Behrens, who introduced the deputation, said that the supply of cheap gas and electricity was an important and necessary step towards the purification of the city's atmosphere, with all that this meant in health and cleanliness and the amenities of life generally. Of course, as practical men, they realized that the effect of this would be that the contributions from the two departments in aid of rates would be reduced; but he thought the League were justified in asking whether it was right that those adopting this means of lighting and heating, who thus helped to make the air purer and the surroundings brighter, should be forced to pay for what was of benefit to the whole community. It was not suggested that there should be an immediate and entire abolition of the contributions to the rates from the Gas and Electricity Departments, but rather a considerable reduction by a gradual process, on a system which would apply to all the trading Committees of the Corporation.

The case for the Smoke Abatement League was opened by Mr. E. D. Simon, who was followed by Mr. T. C. Horsfall, the Chairman of the Manchester and Salford Sanitary Association, and Professor Chapman, of the Manchester University.

It was urged on behalf of the League that the system of making substantial contributions from the gas and electricity undertakings in relief of rates should be considerably modified, in order that prices might be reduced. While believing that this method of raising money in relief of rates was wholly erroneous, the League recognized it was not practical to abolish the system immediately. They therefore urged the adoption of a scheme which would effect a slight immediate reduction and automatically make further concessions in future.

The present contribution in relief of rates from the Gas Department is £50,000, and from the Electricity Department £24,500; while, in addition, the Gas Committee provide upwards of £10,000 in the form of cheap street lighting. Dealing with this point Mr. Simon called the attention of the members of the Special Committee to the fact that in Glasgow no contributions whatever are paid by the Gas Committee, and that Parliament has prohibited the Corporation from making such payments in future. If Glasgow could manage without taxing gas, why should not Manchester do so? The right basis for these contributions was a maximum of 1 per cent. on the outstanding capital. This limit was imposed by Lord Donoughmore's Committee in the Salford Corporation Gas Bill of 1909. In the case of Manchester, it would mean the following contributions: Gas, £11,000; electricity, £19,000—total, £30,000. "But as the Smoke Abatement League wish to make only an absolutely practical proposal," continued Mr. Simon, "they suggest the following: 3 per cent. on gas, £33,458; 1½ per cent. on electricity, £23,766—total, £57,224. They strongly urge the Corporation to adopt this basis at once."

Professor Chapman advanced three reasons why he was in cordial agreement with the proposal of the Smoke Abatement League. First, it was, he said, generally agreed by economists that it was right for the community to make profits in certain directions in order to subsidize their work; but they must choose the right articles to tax. Gas and electricity were pre-eminently the wrong ones, as their taxation means the pollution of the atmosphere. Secondly, gas-cooking was now about at the margin of profitableness. A small reduction in price might mean a large increase in use, and would therefore pay the community well. Thirdly, the smoke in Manchester was responsible for driving people out of the city, and for the rateable value not increasing as fast as it should do.

At the close of the speeches, it was intimated that the statements laid before the Committee would be carefully considered.

Gas Committee Defer Question of Altered Charges.

It was decided at last Friday's meeting of the Gas Committee to adjourn the consideration of a report which had been prepared dealing with a proposed reduction in the price of gas and a readjustment of some of the charges to large consumers. The suggestions made will be dealt with by the new Committee, which will be constituted after the November municipal elections. The Gas Committee desire it to be understood that as yet nothing definite has been decided upon with reference to the matter.

DERWENT VALLEY WATER ARBITRATION.

An Important Point Raised by Sheffield.

The hearing was commenced on Monday, the 7th inst., and continued on the two following days, at the Surveyors' Institution, Great George Street, Westminster, of an arbitration between the Derwent Valley Water Board and the Corporations of Sheffield, Leicester, Nottingham, and Derby. The proceedings arose out of a resolution by the Board—"That the entirety of the Board's works, including the entire length of the aqueduct as constructed by the Board, is to be regarded as one joint undertaking;" and, following upon this, that the expenditure was to be provided by the four constituent Corporations in their statutory proportions. The arbitration took place under the Act of 1899, which provides for the appointment of a Standing Arbitrator—that gentleman being Mr. C. A. Russell, K.C.

The Counsel engaged were: Mr. E. Honoratus Lloyd, K.C., and Mr. T. C. B. Gibbons, for the Derwent Valley Water Board; Sir C. Alfred Cripps, K.C., M.P., and Mr. C. H. Sargent, for the Leicester Corporation; Mr. Balfour Browne, K.C., and Mr. M. N. Drucquer, for the Sheffield Corporation; Hon. J. D. Fitzgerald, K.C., and Mr. Tyldesley Jones, for the Nottingham Corporation; and Mr. T. J. C. Tomlin, for the Derby Corporation.

First Day.

Mr. Honoratus Lloyd, when the method of procedure to be adopted was under discussion, pointed out that the Board consisted of four constituent authorities; and it was their duty to apportion the cost of the works. They did their best—knowing, of course, that any questions could be raised by any one or more of the constituent authorities for the decision of the Arbitrator. The Board welcomed the inquiry, in which they did not desire to take any part. They did not wish to urge any view on the Arbitrator, but to remain absolutely and strictly impartial as four constituent authorities. Therefore he did not propose to argue anything on behalf of the Board. Any officers or documents required, however, would be produced, to give the parties any assistance they might require in the way of facts.

Sir Alfred Cripps, in reply to a question, intimated that the authorities other than Sheffield adhered to the views expressed in the resolution quoted above.

Mr. Balfour Browne said Sheffield would agree that certain works were joint; and it was only part of them which to Sheffield were not matters of common interest.

The Arbitrator thought the best course would be for them to hear first what were the works which should be exceptionally treated.

Mr. Balfour Browne then proceeded to state the case for the Sheffield Corporation. He said the Board consisted of thirteen members—three represented Derby, four Leicester, three Sheffield, two Nottingham, and one Derbyshire. Thus the Board had an enormous majority against Sheffield; and it was in consequence of this that the resolution referred to had been passed, which put Sheffield in a most serious position as compared with the other authorities, and placed upon their shoulders a huge amount of expenditure, which he said under the Act they had nothing to do with, and that it should be borne by the other three authorities. In 1898, Derby, Leicester, and Sheffield all gave notice of Bills, and each of them proposed to go to the top waters of the River Derwent. They were entirely separate schemes; and each proposed to construct large reservoirs to impound the waters of certain streams, and, by means of a perfectly independent aqueduct, to carry the water to their own towns. Derby was in the watershed of the Derwent, as Leicester might also be said to be; and he believed the argument put forward was that they had certain rights in the waters of their own streams. On the other hand, Sheffield promoted a Bill, under which they sought to construct three reservoirs in the same valley, and to carry the water by means of a tunnel to their works; their argument being proximity to the source. If Leicester had obtained their Bill, they would have had to construct the reservoir

out of their own funds, and carry the water a great distance; and the same remark applied to Derby. Though not having a Bill of their own, Nottingham opposed the measures of the other three Corporations. The Sheffield scheme consisted of three reservoirs, an aqueduct, and a tunnel. However, a joint scheme was decided upon, and in this Nottingham was included. Under the consequent Act of 1899, a number of works had to be constructed—taken from the various Bills. The Howden and the Derwent reservoirs had been built, and from the latter lines of pipes had already been laid down. He believed the length of these to the Leicester County boundary was 55 miles. At Bamford, just below the gathering-ground, there were some acres of filter-beds. All the water that went to the different towns, except that passing to Sheffield, was filtered at Bamford. There was an obligation put upon the Board in the Act of 1899 to treat or filter all water; but this had been modified by subsequent legislation. Derby was to have 25 per cent. of the water, Leicester 35·72 per cent., Nottingham 14·28 per cent., Sheffield 25 per cent. It was further provided that the local authorities in the county of Derby, other than those in the Rother Valley, should be entitled to such supplies as they might require, not exceeding in the aggregate 5 million gallons in any one day. There were also provisions in favour of local authorities in the county of Nottingham. With regard to the total quantity of water obtained, the proportions he had indicated would give Sheffield and Derby 6,833,333 gallons a day each, Leicester 9,763,467 gallons, and Nottingham 3,903,200 gallons This was estimating that the total works would yield 50,000,000 gallons a day, of which one-third had to be deducted as compensation water. The intention was to carry out the works in three instalments. The first was from the Howden and Derwent reservoirs, which it was calculated would furnish 13,000,000 gallons daily for supply purposes. The second was from the Hagg Lee reservoir, and would, it was estimated, provide 10,333,333 gallons; and the third instalment would be obtained from the Ashopton and Bamford reservoirs, which were intended to furnish a further 10,000,000 gallons. Of these three instalments, the first had been carried out. Having indicated the pipe-lines laid and intended to be laid, Counsel went on to say that the works were constructed by the Board, and the money was to be raised by them; but it was to be repaid to the Board in certain proportions by the persons interested. These proportions were matters the Arbitrator would have to deal with under section 85. This section, which he would be called upon to interpret, read—

> The expenditure of the Board in respect of the purchase of lands and of the construction of the reservoirs by this Act authorized, and all other expenditure for the common use or benefit of the four Corporations, including the annual payments in respect of interest and sinking fund in respect of such expenditure, and including also any expenditure for the purpose of carrying into effect the provisions of this Act with respect to supplies to local authorities in the county of Derby (other than the Derby Corporation and the local authorities in so much of the county of Derby as is situate in the Rother Valley) and local authorities in the county of Nottingham shall be borne by the four Corporations in the ratio of their statutory proportions.

This section dealt with three matters which were entirely distinct. First, it dealt with "the expenditure of the Board in respect of the purchase of lands and of the construction of the reservoirs by this Act authorized and all other expenditure for the common use or benefit of the four Corporations." The section then went on to deal with a matter which was not for the common use or benefit of the four Corporations in a sense, and that was the supply to the counties of Derby and Nottingham. There they were to be partners still, as if it were for the common use, because they were to be credited with the moneys received in the same proportion that they bore the expense. Then there was a third matter—

> All other expenditure than that which has been mentioned, including the annual payments in respect of interest and sinking fund in respect thereof, shall be borne by the Corporation or Corporations for whose use or benefit such expenditure is incurred, and if for more than one Corporation shall be apportioned by the Board amongst the Corporations deriving benefit therefrom in the ratio which the statutory proportions bear to each other. All revenue accruing to the Board shall belong to the four Corporations in the like proportions.

This was an entirely separate and distinct matter. Below Lady Bower, Sheffield were not interested at all, as not a drop of their water went below this point. There was an aqueduct from Ambergate reservoir to Langley Mill; but this was entirely for the use of Nottingham. From Ambergate up to the reservoir, however, Nottingham, Derby, and Leicester were all interested. In the same way, below Ambergate, Nottingham were not interested in the Leicester and Derby pipe. The whole intention of this section, as he understood it, was that where there was common use and benefit, they were to stand in as partners, and pay in proportion to the water, but where there was not common use and benefit it was to be borne by the people for whose use and benefit the work was done. The resolution of the Board (or of the majority who were against him), "That, in the opinion of this Committee, the entirety of the Board's works, including the entire length of the aqueduct as constructed by the Board, is to be regarded as one joint undertaking, and that the expenditure thereon has accordingly to be provided by the four Corporations in the ratio of their statutory proportions," was leaving out of the section every word from "all other expenditure" down to the end.

The Arbitrator: The section begins: "The expenditure of the Board in respect of the purchase of lands." There is no question about this, because the Act of Parliament says that the whole of the expenditure in respect of the purchase of land is to be borne in statutory proportions.

Mr. Balfour Browne: I think not. I distinctly say that the lands and reservoirs are both governed by the words "common use or benefit." My contention is that if they bought land for Ambergate reservoir, this was not for common use or benefit. Ambergate reservoir was 20 miles below where Sheffield took their water. The same applied to the land for the aqueduct. The land was as much part of the aqueduct as the pipe or the labour. He divided the expenditure

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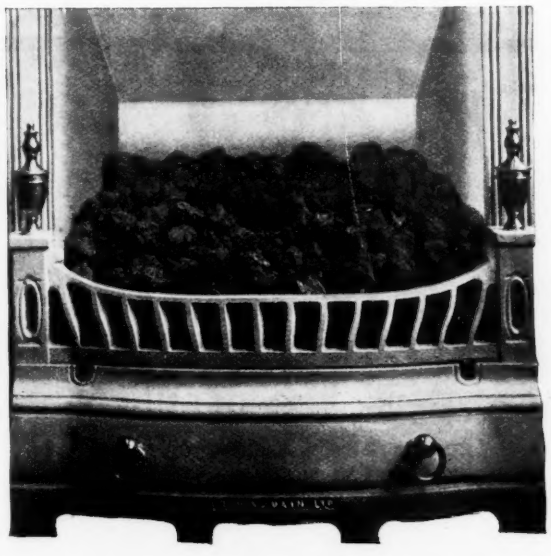

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under three heads: Lands and reservoirs for common use; then the partnership for the supply of Derby county; and lastly all expenditure intended only for the benefit of one particular county.

The ARBITRATOR: Your contention is that it means the expenditure of the Board in respect of the purchase of lands for the common use or benefit of the four Corporations, the expenditure of the Board in respect of the construction of the reservoirs by this Act authorized for the common use or benefit of the four Corporations, and all other expenditure for the common use or benefit of the Corporations?

Mr. BALFOUR BROWNE replied that that was so. In the first part of the section they were partners for benefit—they were all to get water. In the second part of the section they were partners for profit; and in the other portion, they were not partners at all—it was an individual benefit which was to be obtained, and an individual benefit which was to be paid for. The Bamford filters where they were now constructed were away from the Sheffield tunnel altogether; and, so far as filtration was concerned, the powers of the Board had been modified by an agreement embodied in another Act. All water going to the other towns had to be filtered or treated; but that delivered to Sheffield was unfiltered. Yet in the resolution of the Board the matter was to be treated as an entirety, and Sheffield were to pay thousands of pounds for filters which were not filtering their water. Alterations in the scheme were made in Acts passed in 1901 and 1903. The aqueducts authorized by the 1899 Act were not suitable, by reason of their levels and position, for the supply of water to Sheffield; and therefore the Corporation were authorized to construct a separate aqueduct of their own from the Derwent reservoir. The alterations made in the scheme, however, rendered this unnecessary; and it was agreed that the Board should construct their aqueduct of such dimensions as might be necessary to admit of supplying Sheffield as well as the other authorities. It was quite certain that the extra cost of this aqueduct, as compared with the previous scheme, was for the exclusive benefit of Sheffield, and was not an increase in the size of the pipes which was to inure to the benefit of the other places. What the Board ought to have arrived at was the extra cost of this work from Derwent down to Lady Bower—which was easily done. The preamble to the 1903 Act contained the following recital:—

> And whereas the delivery of the water at such higher level will be of great advantage to the city, and it is therefore expedient to authorize the Corporation to abandon the construction of the work No. 2 above mentioned, and to construct in lieu thereof the aqueduct, conduit, or line of pipes in this Act described; and it is also expedient in connection therewith to authorize the Corporation to contribute to the expenses incurred by the Board for the purpose of delivering the water at such higher level as aforesaid.

This indicated clearly that at that time Parliament did not think Sheffield was liable to contribute anything for the tunnel or aqueduct—they having, of course, until then had the obligation of making a tunnel or aqueduct for themselves. The resolution passed by the Board with regard to the apportionment of the expenditure on the works carried out was a monstrous one from the point of view of Sheffield, but it was one that he could quite understand the other local authorities being in favour of passing. Roughly, it amounted to Sheffield paying £295,648 for works which did not affect Sheffield a bit—or, in other words, it made them pay £15,229 annually, which, of course, went into the pockets of the other three constituent authorities. This was for works which were below Lady Bower. This sum of £15,229 thus paid annually by Sheffield, would mean that Derby would be relieved to the extent of £2288, Leicester £9002, and Nottingham £3939. The section to be interpreted was an agreed one; and was it likely that Sheffield would agree to pay £295,000 for the benefit of the other Corporations? Was it likely that they would take an annual burden on themselves of £15,229 for works which did not do them a bit of good? This was not the idea of the section. The whole of the outlay was for works which were included in the latter part of the section—"All other expenditure, including annual payments in respect of interest and sinking fund in respect thereof, shall be borne by the Corporation or Corporations for whose use and benefit such expenditure has been incurred." A table prepared by Mr. William Terry, the General Manager of the Sheffield Corporation Water-Works, gave the apportionment of the capital cost of the works between the four Corporations, showing approximately the difference involved on the basis of Sheffield's contention as compared with the Board's resolution. Sheffield's proportion, calculated on the expenditure north of the Sheffield tunnel (£2,030,747), came to £511,664; whereas 25 per cent. of the total capital expenditure of £3,229,246 would come to £807,312. Thus the difference against Sheffield, under the Board's resolution, of £295,648, was arrived at. Counsel was proceeding to deal with the amounts he maintained were payable by each of the other Corporations for the works below Lady Bower, when

The ARBITRATOR pointed out that, after he had decided what works Sheffield were and were not interested in, it might be that there would then be consequentially a set of very nice questions as to the apportionment between the other three authorities. If the Board were incorrect in their present contention, they would have to make another apportionment.

Mr. BALFOUR BROWNE said he did not wish the Arbitrator merely to say the Board were wrong. He must tell them what was right.

Counsel for the other authorities also intimated that they would like the basis of apportionment laid down—but not the actual figures.

On the conclusion of Mr. Balfour Browne's speech, the proceedings were adjourned.

Second Day.

Mr. HONORATUS LLOYD intimated that the Board's Engineer was in attendance to answer any questions of fact that either Counsel or the Arbitrator desired to ask.

Mr. *Edward Sandeman*, in answer to Mr. BALFOUR BROWNE, said he had been Engineer to the Board since 1900. Leicester took their

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water at Sawley, which was 49 or 50 miles from the Derwent reservoir; and the Derby Corporation took theirs at Little Eaton, which was 33 or 34 miles away. From Derwent to Lady Bower was from 3¼ to 3½ miles. From Lady Bower to Ambergate was a distance of about 28 miles; and the pipes and tunnel covering this were to be used exclusively for the water for Derby, Nottingham, Leicester, and Derby county. The extensive filter-beds at Bamford had cost over £100,000. Generally the pipes and culverts had been made of sufficient size to supply county authorities when required. It was difficult to say what was the cost of this enlargement.

The ARBITRATOR: You are going to ask me to say that a different principle may be applied to the excess over what would have been expended if this provision for the county supply had not been made, from that which would be applied to the rest of the expenditure?

Mr. BALFOUR BROWNE: Certainly, my own contention is that it is perfectly clear that the cost of the provision made in the aqueduct for the supply of water to local authorities in the county of Derby is an expenditure properly chargeable under section 85 of the Act of 1899. That is the first contention. But the amount so charged should be the actual excess in cost of the aqueduct with the local authority provision over the cost of the aqueduct without the local authority provision, as against the contention of the Board, which I understand is that such amount should be based upon a proportion that the water for which provision is made for the local authority bears to the total supply which the various works are capable of affording.

Questioned by Sir ALFRED CRIPPS, witness said that if a separate pipe had been laid near Sheffield from the Derwent reservoir to Lady Bower, the cost would have been from £15,000 to £20,000. It would have cost much more to lay a separate pipe for the county authorities than to enlarge the aqueduct or main pipe of the Corporations as had been done. Arrangements had been made to supply Ripley and Long Eaton with water.

In answer to Mr. FITZGERALD, witness said that all the water which might have to be given to the county authorities in Nottinghamshire would have to pass through the aqueduct from Ambergate to Langley Mill; but in the scheme they had not allowed for it. Further, any water which was to be supplied to the local authorities in Derbyshire adjoining this pipe would have to pass through it. The Ripley supply was taken from it. Similarly with regard to the aqueduct from Ambergate to Sawley, this would be used for the purpose of giving supplies in Derby county. The Ambergate service reservoir would also be used for these supplies; and so would the Bamford filters. Then, in addition to the county supplies, they were under obligation to give supplies to various landowners along the route, and below Lady Bower.

Mr. *Samuel Seager*, the Accountant, was then called, and questioned with regard to the establishment charges.

Sir ALFRED CRIPPS then presented the case for Leicester. He said he would have thought it was open to no question that all the lands purchased under the Act of 1899 were to be treated as a joint expenditure—in other words, as an expenditure incurred for what had been called the common use or benefit of the four Corporations. The Act said so in terms. Reservoirs followed the same principle. Then the Arbitrator had to consider what other expenditure was for the common use or benefit of the constituent authorities. It did not at all depend upon the amount expended. The benefit might be exceedingly small; but so long as the works in question were for the common use or benefit, they were brought in so that the expenditure was borne by the four Corporations in the ratio of their statutory proportions. The majority of the Board were right when they held that all the expense incurred in connection with the Act, right down to the Langley Mill and the Leicester connection, was outlay incurred for the common use or benefit. It was true that Sheffield did not use the aqueduct below Lady Bower for water to be used in Sheffield. But the works carried out below Lady Bower down to Nottingham and Leicester were really works which were an essential part of the scheme as a whole; and therefore Sheffield could not have secured the advantage of taking water out of the Derwent Valley except these other works had been constructed, which carefully preserved the water rights of a large number of people interested in the River Derwent. It was a joint water-works construction system which one could not separate—particularly having regard to the obligations and liabilities incurred, which appeared on the face of the Act. Sheffield said: "Let us take water out of the Derwent Valley into the Sheffield district;" and the Act said: "You may do so, but you must contribute to the cost in proportion to the water taken."

The ARBITRATOR: That is not what the Act says.

Sir ALFRED CRIPPS admitted that the Act did not say so in terms. It left open the very question they were now discussing. There were various obligations placed upon the Board by the Act to supply water to different persons; and without these Sheffield could not have obtained their supply. Therefore Sheffield must derive benefit from the works carried out. In the revenue derived from these obligatory supplies, Sheffield would benefit in their statutory proportion. As to the provision made for supplying the county authorities, whatever it was it had to be borne by the four Corporations in the ratio of their statutory proportions.

Third Day.

Sir ALFRED CRIPPS, resuming his argument, said it was quite clear that a proportion of the expenditure on filter-beds was for the supply to the county authorities. Therefore it would have to be considered. The four constituted authorities had to take the whole of the obligation in the first instance; and they would only get a return from the local authorities when these bodies required a supply of water.

Mr. BALFOUR BROWNE: Your argument with regard to the filter-beds is that we are not responsible for the filter-beds except so far as the county authorities' supply is concerned?

Sir ALFRED CRIPPS: Subject to my major argument.

Mr. BALFOUR BROWNE: I admit distinctly, with regard to the filter

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beds for Derby county, that we must pay the extra cost; and not only for the filter-beds, but for the land on which they stand.

Mr. SARGENT then further took up the case of Leicester. He quoted sections to bear out the argument that the obligation to supply the local authorities was a first charge.

The ARBITRATOR: There is no obligation here to construct, in the first instance, works sufficient to give them all a supply.

Mr. SARGENT: Only this, that you cannot give a supply at all unless you supply to the local authorities.

The ARBITRATOR: I do not at present see that.

Mr. SARGENT next proceeded to give some figures to show what the result was of Sheffield's contention. He said, assuming that the expenditure down to the Sheffield tunnel works was £1,000,000, in round figures, and that the expenditure on works from the Sheffield tunnel to Ambergate was another £1,000,000, and that the proportion of water that had to be supplied to the local authorities was one-fifth of the total, the result would be that the local authorities taking from Ambergate would have to pay interest on one-fifth of £2,000,000, or £400,000. Sheffield said they had not to pay anything in respect of the works from Sheffield junction to Ambergate, so that only £1,000,000 had to be considered. As to this amount, they further said that they had only to pay on the sum which represented the increase in the diameter of the pipe. Assuming this to be one-tenth, all Sheffield would have to pay would be £100,000; while they would receive on £400,000.

The ARBITRATOR: I must leave Mr. Balfour Browne to say whether you have correctly represented his argument. I do not think you have represented his view as to the share of expenditure which Sheffield would bear. I do not myself invite anybody to go into it further, because it is not a line of argument which helps me very much in this case. Here is a statutory bargain, and we have to do the best we can to interpret the terms. I think there are either way results which I will not say are absurd, but which appear not to be reasonable.

The Hon. J. D. FITZGERALD said the position of the Corporation of Nottingham was substantially the same as that of Leicester; and he would therefore adopt the arguments already advanced. He would, however, like to add a few words on section 85. The wording of the section showed that the expenditure on the purchase of lands and the construction of reservoirs was expenditure for the common use or benefit. Mr. Balfour Browne, though he did not say so in terms, based his argument throughout on this—that benefit depended on user, and that where there was no user or work for the purpose of giving a supply to Sheffield, the work was not a benefit to them. The argument was absolutely fallacious, and was demonstrably wrong. They were dealing with a large scheme for the supply of four Corporations; and under the terms of the Act this scheme could not be carried out without the construction of certain works which were not works for supply at all, or not works for the supply of any particular Corporation. For instance, two reservoirs had to be constructed not for supply at all. Not a single drop of water would ever go to Sheffield from the Ashopton and Bamford reservoirs; but they were both absolutely necessary for carrying out the provisions of the Act, which were that if they took water they must give back compensation water to the stream. Again, where they constructed works producing revenue, and this revenue was to be divided between the four Corporations, how could it possibly be said that these works were not for the common benefit? The construction of the section must to a large extent depend on the general scheme of the Act. This general scheme was that there was a large watershed; that a Joint Board was to be constituted for giving a supply to the four Corporations in certain proportions; and that the works to be constructed by the Joint Board represented the joint undertaking, the expense of which was to be borne in their statutory proportions by the four Corporations. If this construction was given to the Act, all the difficulties disappeared. The whole of the aqueducts, also, were works which must be used for giving a supply to the county authorities, which supply was, in the very terms of the Act, for the common benefit of the four Corporations.

Mr. TOMLIN, for Derby, remarked that the matter had been so fully argued that he had little to add. In the main he adopted the arguments already addressed to the Arbitrator, and particularly the argument that what they had to look to in construing the Act was first the circumstances under which the Act was passed. It was an arrangement under which only on the terms of complying with all the statutory provisions of the Act could anybody get a drop of water at all.

The ARBITRATOR intimated that he would particularly like to hear Mr. Balfour Browne on the question of benefit.

Mr. BALFOUR BROWNE said he maintained that section 85 contemplated three things—that the Board should carry out works which were to be for the common use or benefit of the four Corporations; secondly, whether they were for the common use or benefit of the Corporations or not, they should carry out works for the supply of the local authorities in the county; and, thirdly, that they should carry out works which were for the use or benefit of particular Corporations. With regard to "use," there was, he thought, no question between them. If Sheffield promised to pay £295,000 for which they were to get no benefit whatever, but for the benefit of the other three Corporations, then Sheffield made a bad bargain. Was that the meaning of the section? If his learned friend's argument on the first part of the section was right, what was the use of the rest of the section? Portions of the pipe-lines were for the use and benefit of a particular Corporation; and the pipe-line between Ambergate and Lady Bower was for the use and benefit of the three Corporations, excluding Sheffield. Again, section 85 stated that "all revenue accruing to the Board shall belong to the four Corporations in the like proportions." This did not mean, as his friend had said, the statutory proportion. If, for instance, there was any revenue derived from a special work, it might go to one. He would ask for the award to be stated in the form of a special case, so that if necessary the matter could be taken elsewhere.

Some discussion then ensued as to what the Arbitrator was to decide, and as a result the submission was put in the following form—

"Upon what principle any, and which, of the expenditure incurred by the Board down to Dec. 31, 1911, ought to be borne by the four Corporations in the ratio of their statutory proportions?"

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NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

Edinburgh.—On Saturday next, the members of the Western District of the Scottish Junior Gas Association will pay a visit to the works of Messrs. Parkinson and W. & B. Cowan, Limited, Buccleuch Street Meter-Works, Edinburgh, and subsequently to the Gas Exhibition in the Waverley Market. The next ordinary meeting of the Association will be held in the Royal Technical College, Glasgow, on the 9th prox., when addresses will be delivered by Mr. John Fraser, of Provan, and Mr. James M'Leod, of Greenock, entitled respectively "Some Practical Observations" and "Thoughts on Purification."

Glasgow.—The number of visitors to the Smoke Abatement Exhibition is returned at 93,000.

Alloa.—It was resolved at the Town Council meeting on Monday that the salary of Mr. J. W. Napier, the Manager of the Gas and Electricity Department, should be increased by £50 per annum.

Arbroath.—The expenses in connection with the recent Gas Provisional Order amounted to £353—£150 less than anticipated.

Broughty Ferry.—An honorarium of £20 was granted to Mr. Keillor, the Gas Manager, at a meeting of the Town Council on Monday, for extra work in connection with the installation of the automatic street lighting, described at the last North British Association meeting.

Coatbridge.—An exhibition of modern gas apparatus was held for several days in the Town Hall under the auspices of the Coatbridge Gas Company. The opening ceremony was performed by Provost and Mrs. Davidson, and was one of the best of its kind ever seen in Coatbridge. The large hall was filled with exhibits of the various kinds of high and low pressure gas lighting, cooking utensils, gas-fires, &c. Cooking and laundry demonstrations were given at intervals.

Dunfermline.—At the monthly meeting of the Town Council on Monday—Provost Husband presiding—the Town Clerk reported that he had written to the Town Clerk of Culross with reference to the proposed gas supply for that burgh, and had received a reply intimating that the Culross Council had resolved that, for the time being, they would not take a supply. The Town Clerk was instructed to write again inquiring whether the Town Council would allow the Dunfermline Council to lay their gas-mains through Culross. The Gas Committee have had under consideration the terms upon which high-pressure lamps should be supplied for lighting shops. It was agreed on Monday that consumers should be charged with the cost of the lamps supplied, but should be allowed to pay it by instalments spread over a period of three years; that the gas supplied should be charged for by way of a fixed sum per annum according to the size of the burner; and that the cost of the mantles and globes should also be charged to the consumers.

North Berwick.—A special meeting of the Town Council was held on Tuesday—Provost Macintyre presiding. Mr. Liston Blyth, the Convener of the Gas Committee, submitted his statement of income and expenditure for the year, and mentioned the highly satisfactory working, notwithstanding the increase in the price of coals. It was agreed that the price of gas be reduced to 2s. 8½d. per 1000 cubic feet.

Pathhead.—A peculiar gas escape occurred on Wednesday afternoon, when a brilliant flame issuing from the top of one of the water-conductors attached to the Kirkcaldy Linoleum Works was observed. Investigation showed that there had been an escape of gas in the main gas-pipe, and the escaping gas had found its way into the conductor, and been ignited by a spark from the works chimney.

Turriff.— The sixth ordinary general meeting of shareholders of the Turriff Gas Company was held in the Town Hall on Monday evening. The Directors submitted a statement of the accounts of the Company for the year ended June 24 last. The sum at the credit of the profit and loss account was £316. It was agreed that a dividend at the rate of 5 per cent., free of income-tax, on the paid-up capital of the Company be paid. This amounted to £81; leaving £235 to be carried forward to next year's account. A reduction in the price of gas of 3d. per 1000 cubic feet to ordinary consumers was agreed to.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 19.

Sulphate of Ammonia.

There has still been no sign of an improvement in the position of this article during the past week, and it has only been possible to effect further sales by accepting still lower prices. United States buyers continue very apathetic, and the demand from other consuming countries has not been sufficient to make any alteration in the tone of the market. The closing quotations are £14 1s. 3d. per ton f.o.b. Hull, £14 2s. 6d. per ton f.o.b. Liverpool, and £14 3s. 9d. per ton f.o.b. Leith. Producers maintain very conservative views as regards future delivery; but middlemen are content with prompt values up to the end of this year, and with a comparatively small premium over the first six months of 1913.

Nitrate of Soda.

The market for this material is again dearer, and the values on spot now are 11s. 7½d. per cwt. for ordinary quality, and 11s. 9d. for refined.

LONDON, *Oct.* 21.

Tar Products.

There are one or two alterations in the market for tar products. Pitch has weakened further; and several sales are reported for near and forward delivery at lower prices. Although the position in benzol still remains fairly steady for prompt, considerably lower prices have been accepted for December delivery onwards. There appears to be more solvent naphtha offering for near delivery, and contracts are reported at lower figures. Heavy naphtha maintains its price; and there is a fair amount of inquiry in the market. Creosote

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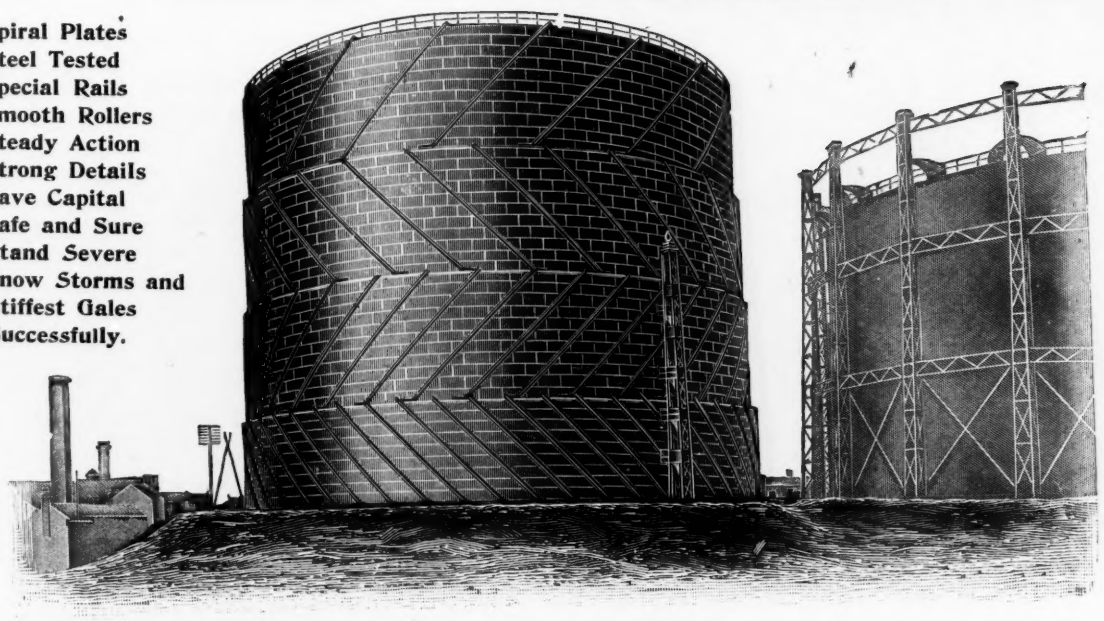


From a Photograph showing the conversion of a Two-Lift Guide Framed Holder to a Four-Lift Spiral Holder of 3½ million cubic feet capacity, for the Newcastle and Gateshead Gas Company, to Plans and Specifications of W. D. GIBB, Esq., M.Inst.C.E., Engineer.

is still exceedingly firm, and shows no signs of weakening. The position is unchanged in crude carbolic.

The average values during the week were: Tar, 27s. 9d. to 31s. 9d. Pitch, London, 45s. to 46s.; east coast, 45s. to 45s. 6d.; west coast, Clyde, 46s. to 47s.; Manchester, 44s. 6d. to 45s.; Liverpool, 44s. 6d. to 45s. 6d. Benzol, 90 per cent., naked, London, 11½d.; North 10½d. to 10¾d; 50-90 per cent., naked, London, 11d.; North, 10½d. to 11d. Toluol, naked, London, 11½d. to 1s.; North, 11d. to 11½d. Crude naphtha, in bulk, London, 5½d. to 5¾d.; North, 5d. to 5½d. Solvent naphtha, naked, London and North, 1s. 1½d. to 1s. 2d. f.o.b. Heavy naphtha, naked, London, 11½d. to 1s. f.o.b.; North, 10d. to 11d. f.o.b. Creosote, in bulk, London, from 3½d. to 3¾d.; North, 3d. to 3¼d. Heavy oils, in bulk, 3⅜d. to 3½d. Carbolic acid, casks included, 60 per cent., east coast, 1s. 11d. to 2s.; west coast, 1s. 10½d. to 1s. 11d. Naphthalene, £5 to £9; salts, 45s. to 55s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

There has been little doing in this article during the past week; and some very low prices are reported to have been accepted for prompt delivery. Outside London makes are £13 8s. 9d.; Hull, £14 1s. 3d. to £14 2s. 6d.; Liverpool, £14 2s. 6d. to £14 3s. 9d.; Leith, £14 3s. 9d. to £14 5s. Middlesbrough, £14 1s. 3d. to £14 2s. 6d.

COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade is rather more active on the whole; but there is still a little scarcity of shipping to carry the fuel. In steam coals, best Northumbrians are about 13s. 3d. per ton f.o.b.; second-class steams are from 11s. 9d. to 12s. 3d.; and steam smalls from 9s. to 10s. 3d.—the latter being firm and not quite so plentiful. In the gas coal trade, there is an increasing demand, and prices are firmer. Best Durhams are from 13s. 6d. per ton f.o.b.; and second-class gas coals are from 13s. "Wear specials" are about 14s. to 14s. 6d. per ton. Tenders have been sent in for contracts for one of the Norwegian gas undertakings; but details have not officially transpired. Other contracts are in negotiation for Continental gas-works; but the high rates of freight influence the cost of the coal delivered, and thus buyers only operate cautiously, though, of course, these sea freights are on coal from all our fields. There seems, however, the idea prevailing that there will be high prices for coal for next year. Coke is steady. Gas coke is in enlarging production, which is well taken up. Good gas coke is 22s. per ton f.o.b.

Scotch Coal Trade.

As compared with last week, there is very little change in the Scottish coal trade. Tonnage is not too plentiful. On the Glasgow Coal Exchange on Friday, the f.o.b. prices were: Steam coal, 11s. 6d. to 12s. per ton; splint, 13s. 6d. to 14s.; ell, 12s. 3d. to 12s. 9d.; trebles, 13s. to 13s. 6d.; doubles, 12s. 6d. to 13s.; and singles, 12s. to 12s. 6d.

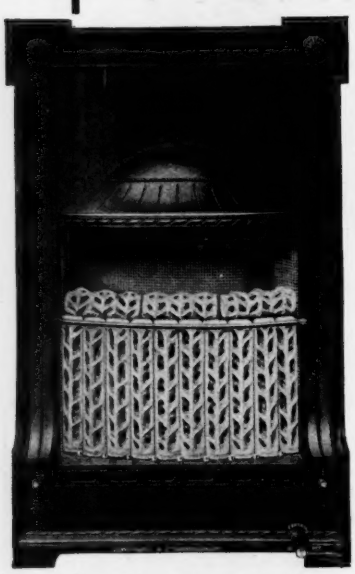
Preston Gas-Works Assessment Reduced.—At the General Quarter Sessions at Preston last Thursday, the Preston Gas Company were successful in their appeal against the poor-rate assessment, which, by consent, was reduced by £650 pending the making of a new assessment. An order was also made for the return of £37 18s. 4d. paid by appellants on the basis of the amount in dispute.

Ceara Gas Company, Limited.—At the annual general meeting of this Company on Friday, the Directors will report that the result of the year's working is a net profit of £7674, which, added to the balance brought forward, gives a total of £15,085. Deducting the interim dividend paid in April last, there remains £13,404 available for distribution; and the Directors recommend the payment of a dividend for the six months ended June 30 of 5 per cent. on the preference shares (less income-tax), and of 7 per cent. on the ordinary shares (tax free)—making together £2881. These payments, with the interim dividend already paid, will make 10 per cent. on both the preference and ordinary shares for the year. The balance carried forward will be £10,522.

Gillingham and the Municipal Coal Proposal.—That the Government should be approached to grant powers to local authorities to retail coal for household and other purposes in their respective areas, was the object of a resolution moved by one of the members at the last meeting of the Gillingham Town Council; but the proposal met with scant favour—only five voting for it. One member asked why they should stop at coal; and another retorted that he would go in for milk, too. The arguments adduced by the mover of the resolution were that they "had all been fleeced" in the recent coal strike; and that if it was right for corporations to supply gas, it was a logical sequence to go on to coal. In some cases they supplied gas-stoves, and so took the place of coal. This being so, what objection could there be to going a step farther?

Electric Light Failures.—The electricity supply in Merthyr and Dowlais was interrupted on the evening of Sunday, the 13th inst. The places of worship where electric light had been installed and the main streets were in darkness, as were also all the streets in Dowlais, for about a quarter of an hour. Owing to the fusing of an important cable in the Berlin Electricity Works last Thursday night, portions of the city were plunged into darkness, and there were in consequence many remarkable scenes and incidents. There was great interruption of street traffic and of means of communication in several of the central thoroughfares. Last Saturday week, there was a failure of the electric light at St. Leonards, which, for the space of an hour or so during the evening, put the consumers to the inconvenience of being without light. The trouble arose at a sub-station.

WRIGHT'S NEW BUILD-IN GAS GRATE MOVEMENT.



The "STANDARD."

It would be difficult to exaggerate the great departure in gas-heating ushered in by the introduction of these apparatus, and the wide possibilities they open up. Hitherto a Gas-Fire has been introduced into houses where coal fires were already built-in. The Great "Boom" in Gas-Fires which has now set in has prepared the way for a new movement, namely, the building-in of the gas grates in newly-built houses, from the outset. Our new "Times" and "Standard" Gas Grates are expressly fitted, both in design and price, to render such a movement general, and those who are building houses can now instruct their architect to fit them throughout with built-in Gas Grates.

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Labour Co-Partnership Association.

Unusual importance is attached to the half-yearly meeting of this Association, which is to be held at Birmingham a few days after the municipal elections next month. Earl Grey will preside at the meeting in the Midland Institute, on the 9th, when Lord Robert Cecil, M.P., will give an address on "The Human Side of Co-Partnership." On the preceding evening, a meeting in connection with the newly-formed Consultative Council of the Association will be held at the University, under the presidency of Alderman F. C. Clayton, J.P., the Pro-Vice-Chancellor, when Sir W. H. Lever, Bart., will read a paper on "Co-Partnership and Efficiency," and Mr. Corbet Woodall, M.Inst.C.E., will deal with the application of co-partnership to municipal enterprise. We learn from the Assistant-Secretary (Mr. Ernest W. Mundy) that many leading employers of labour will attend these meetings, which should do much to bring the subject of co-partnership before the industries of the Midlands, as well as to all who are anxious to see municipal enterprise conducted on lines likely to secure satisfactory relations between the ratepayers and those they employ.

Newtownards Gas Supply.

Mr. P. C. Cowan, Chief Engineering Inspector of the Local Government Board for Ireland, recently held an inquiry at Newtownards (Co. Down) regarding the Urban Council's application for sanction to a loan for the provision of gas-mains. Mr. J. M'Kee, on behalf of the Council, said it was desired to extend the mains to portions of the urban district, as well as to places slightly beyond it where the Council had legal power to supply gas. A considerable sum would be devoted to increasing the efficiency of the present supply by the introduction of the high-pressure system. In parts of the town where it was thought undesirable to adopt this system, it was proposed to substitute larger mains for those already existing. The Town Clerk (Mr. H. M'Cartney) spoke of the efficiency of the gas-works and the satisfactory state of the business. The ordinary price of gas was 2s. 11d. per 1000 cubic feet, and discounts ranging from 1¼ to 12½ per cent., according to annual consumption, were allowed, while there was an additional discount of 1¼ per cent. for prompt payment. The Gas Manager (Mr. W. H. Roberts) said in his opinion the additional expenditure was necessary, because the greatly increased output of gas had rendered the present mains insufficient. The Chairman of the Council (Mr. W. J. Ferguson) said they had fifty applications for gas which they could only take in turn owing to their limited resources.

The Directors of the Continental Union Gas Company, Limited, have decided to recommend, at the general meeting to be held on the 3rd of December, dividends for the past half year of 2 per cent. on the ordinary stock, free of income-tax, and of 3½ per cent. on the preference stock, less income-tax; making for the year 4 per cent. on the former and 7 per cent. on the latter.

Liverpool Water Supply.

Replying to a vote of thanks at the final meeting for the municipal year of the Liverpool Water-Works Committee, the Chairman (Colonel Porter) said that the total volume of water supplied during the twelve months to Sept. 30 was 13,218 million gallons, of which 11,627 million gallons were distributed within the compulsory area; the remainder being sold in bulk to other authorities on the Vyrnwy and Rivington aqueducts. The total weight of water amounted to 57,867,000 tons; and this was conveyed (as far as Vyrnwy water was concerned some 70 miles, and Rivington some 40 miles) to the consumer, at a cost of £77,886, equal to less than ¼d. per ton; the remainder of the debit side of the account being made up of interest and sinking fund and rates and taxes, over the amount of which (some £285,000) the Committee had no control. The cost of conveyance was remarkably small, and left very little (if any) room for economy. There had been an increase in consumption all round, as compared with the previous twelve months—totalling 517,783,000 gallons. The Committee had been fortunate enough in the last few days to purchase, on reasonable terms, the whole of the Marchnant watershed, an area of some 1700 acres, thereby continuing the policy long ago laid down by the Council, that it was their duty, as opportunity arose, to become the owners of all their watersheds. The principal works that had engaged the attention of the Committee during the last twelve months had been the construction of a new balancing reservoir at Malpas, and the covering of a further section of the goit at Brinscall on the Rivington works. Their afforestation work on both watersheds had been continued at the normal pace; but they were hoping very shortly to arrange for large schemes of afforestation to be carried out in co-operation with the Government, through the Development Commissioners, by which means they would be able to proceed much more rapidly with this important work, without cost to the ratepayers.

Belfast Water Board Finances.—The report of the Belfast Water Board's Finance Committee, adopted at a recent meeting, recommended rates for the financial period ending on Oct. 31, 1913, at 16d. in the pound for domestic and 4d. in the pound for public purposes. The expenditure for next year was estimated at £112,540; and of this, £81,123 is required for payment of interest on mortgages and dividends on stock and contribution to the sinking fund. Mr. Courtney explained that in 1903 Parliament granted a postponement for a period of ten years of the sinking fund payments under certain Acts. This period expired with the present year, and the Commissioners had to resume payments. For next year the amount would be £10,938. It has been pointed out, in relation to this charge, that there is a balance of £3500 on the wrong side of the estimate for next year. The Board, however, have saved a little money to enable them to meet the deficit until they get the new Happy Valley storage reservoir well under way, when an increase in the rates will be inevitable.

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A high class fire at a popular
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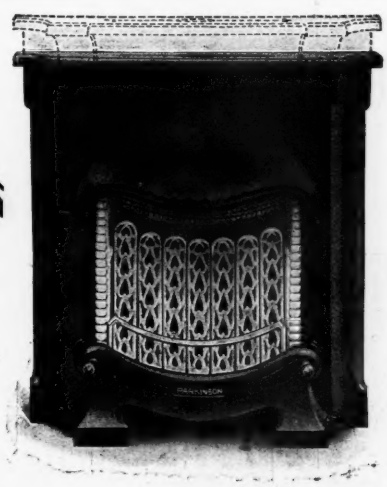
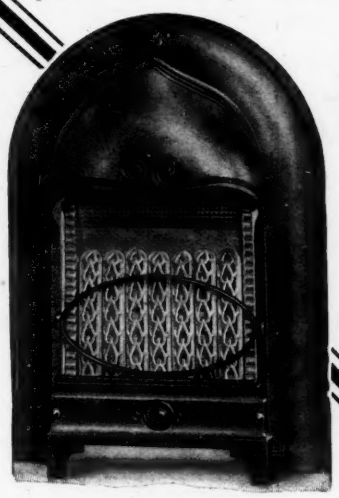


The "ELYSIAN,"
showing adjustable cornice.



The "SPARTAN,"
One of the P.S.C. Series.

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ON ALL CHIEF GAS UNDERTAKINGS'
HIRE LIST.

THESE ARE THE FIRES YOUR CONSUMERS WANT.

THE PARKINSON STOVE COMPANY, LTD.,
BIRMINGHAM & LONDON.

Supply of Current to Public Lamps at Hastings.

The Hastings Electricity Committee have reported to the Town Council that they had had before them correspondence between the Engineer and General Manager of the Gas Company (Mr. C. E. Botley) and the Town Clerk on the subject of the removal of the services and fittings from certain gas-lamps to enable the same to be fitted for lighting by electricity. From this it appeared that the Company raised objection to the removal of the services, &c., on the ground that the lamps were at a greater distance than 60 feet from the electricity mains, which distance was fixed by the order of the Council of June 19, 1908. Under the terms of such order, a standing instruction was given to the Committee "to in future supply current to all public lamps in the streets under which electric mains are now laid, or under which such mains may hereafter be laid (and which lamps may be within a distance of 60 feet from the main), on the terms above mentioned," which terms were set out. With a view of obviating difficulty in future, the Committee recommended that the order referred to be so varied as to admit of current being supplied to any public lamp within a reasonable distance of an electricity main—such distance, however, not in any case to exceed 70 yards. When the matter was discussed in the Council, Mr. Hocking said it was a serious thing to convert the limit of 60 feet into 210 feet, as it might lead to great expenditure. Another member thought the 70 yards was a "misprint" for 70 feet; but from subsequent remarks, it seems he was wrong.

A tastefully got-up booklet, bearing the title of "Winter Comfort," has just been issued by the Davis Gas-Stove Company, Limited. It is a catalogue of gas-fires for the coming season, all of which are effectively illustrated. Another booklet from the same firm deals with the subject of "Steamless Heating," in connection with their gas-heated steamless radiator and luminous "steamless."

Cromer and the Electric Light.—The Cromer Urban District Council have decided to transfer their electric light undertaking to Messrs. Edmundson, subject to certain conditions and the sanction of the Board of Trade and the Local Government Board. As the subject has never come up in open Council before, much surprise has been expressed in the town. The sum of £30,000 has during the past ten years been raised on loan on security of the rates. Hitherto, it is stated, Messrs. Edmundson have been running the undertaking; they having to pay each year a sum equal to the amount of the principal and interest repayable on loan by the Council. Some £7000 has been so paid off; and one of the conditions of the contemplated transfer is a cash payment to the Council of £18,000 in extinction of the outstanding liabilities in respect to loans obtained.

Oldham Gas Workers' Wages.—The Oldham Town Council met specially last Wednesday for the purpose of considering a letter which had been received by Mr. Arthur Andrew, the General Manager of the gas undertaking, from Mr. J. R. Clynes, M.P., the Secretary to the Gas Workers and General Labourers' Union. This communication, which was dealt with in the "JOURNAL" last week (p. 239), had reference to a demand for increased wages by certain grades of men employed at the gas-works, and a week's holiday each year, with pay, for all classes of workmen. On two previous occasions, the Gas Committee decided not to concede the demands of the men, but recommended that, as regarded the application of the labourers for an increase of ½d. per hour and re-arrangement as to holidays, there should be a joint meeting of all the Committees employing this labour, with a view to drawing up a scale to apply to all the labourers in the Corporation's service. The meeting of the Council last Wednesday was not open to the Press. At the close of the proceedings, however, it was announced that the Council recommended the Gas Committee to agree to receive another deputation from the men. A special meeting of the Committee was afterwards held, and the recommendation of the Council was agreed to.

GAS COMPANIES' STOCK AND SHARE LIST.

The week just concluded on the Stock Exchange presented a vivid contrast to its predecessor. After the intense gloom in which the previous Saturday had closed, the re-opening on Monday was a bit shaky at first; but before long, when it was found that the Continental bourses had ceased to sell and were now buyers, the clouds began to clear away. From this point things steadily, though moderately, amended, and with slight occasional checks progressed up to the close; one brighter factor being the Turko-Italian peace. Most markets, except the Foreign, advanced their prices; and even Consols contrived to be with them there. In the weak opening on Monday they had suffered—beating the lowest record with a mark of 72⅛—and Government issues in general were quite flat. But Rails made a partial recovery; and Americans, at the bidding of Wall Street, were quite strong. Foreign were weak. The tone improved on Tuesday; but gilt-edged were not much the better for it, and Consols sulked. Home Rails and Americans were in good case; and even the Foreign Market looked up a little. Wednesday was really cheerful—contemplating the calm in Foreign bourses and the agreement between Italy and Turkey. Gilt-edged improved, Consols recovered ⅛ money and account, and the other leading markets were up. Thursday's doings were very quiet; but the tone was quite good. Gilt-edged were firm, unaffected by the rise in the Bank rate, which came not unexpectedly. The rest were firm, except the Foreign Market. On Friday, the tendency was rather dulled by the usual selling on a small scale. But movements were slight generally; and Government issues were firm. Saturday was a very quiet day. Many members were away—unperturbed by crushing anxieties. There was a nice healthy tone, but movements were slight. Consols rose ⅛, closing at 73 to 73⅛—a rise of ⅛ in the week. In the Money Market, there was a good supply at higher rates. The Bank of England rate was advanced to 5 per cent. on Thursday. Business in the Gas Market was on a much lighter scale. In the London market, not a dozen undertakings were dealt in at all; and what was done in these made up but a light aggregate altogether. Very few quotations underwent any alteration; and what slight changes were made were uneven. In Gaslight and Coke issues, the ordinary was far from active. Transactions were steady at 103 to 104; but the quotation was put down a point. In the secured issues, the maximum changed hands at 81 to 82¾, and the debenture at 76 to 77½. South Metropolitan was moderately dealt in at the old prices—116½ to 117¼—and the debenture realized 78. Nothing at all was done in Commercials. Among the Suburban and Provincial group, Alliance and Dublin was marked at 78⅛, Brentford new at 196 and 197, Brighton and Hove original at 211½ and 212½, ditto ordinary at 152½ and 153, and Maidstone debenture at 69½ and 70. On the local Exchanges, Liverpool "A" fetched 216, ditto "B" 156½ (a rise of ½), ditto debenture 101, and Newcastle 98¾. In the Continental companies, Imperial was 1 lower at 180 to 185. Among the undertakings of the remoter world, Bombay realized 6½, Oriental from 134 to 135, Melbourne 99, Primitiva from 6⅝ to 6 15/16, ditto preference from 5⅛ to 5½, ditto debenture, 97½.

Issue.	Share.	When ex Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
1,551,868	Stk.	Oct. 11	5	Alliance & Dublin Ord.	76–81*	..	6 3 5	561,000	Stk.	Aug. 29	10	Liverpool United A. .	215–217	..	4 12 2
374,000	Stk.	July 12	4	Do. 4 p.c. Deb.	89–91	..	4 7 11	718,100	,,	,,	7	Do. B. .	155½–157½	+½	4 8 11
250,000	5	Oct. 11	7½	Bombay, Ltd. . . .	6⅞–7⅛*	..	5 9 1	306,083	,,	June 28	4	Do. Deb. Stk.	100–102	..	3 18 5
50,000	10	Aug. 29	15	Bourne-) 10 p.c. .	28–29	..	5 3 5	63,480	Stk.	June 28	3	Maidstone 3 p.c. Deb. . .	69–71	..	4 4 6
332,000	10	,,	7	mouth Gas) B 7 p.c. .	15⅝–16½	..	4 6 2	75,000	5	June 14	6	Malta & Mediterranean	4⅜–4¾	..	6 3 1
75,000	10	,,	6	and Water) Pref. 6 p.c.	14–14½	..	4 2 9	250,000	100	Oct. 1	4½	Met. of Melbourne) 4½ p.c. Deb'	99–101	..	4 9 1
380,000	Stk.	Aug. 14	18½	Brentford Consolidated	255–260	..	5 3 10								
330,000			10⅝	Do. New . . .	195–200	..	5 5 0	541,920	20	May 31	3½	Monte Video, Ltd. . .	11–11½	..	6 1 9
50,300	,,	,,	5	Do. 5 p.c. Pref. .	116–118	..	4 4 9	1,775,892	Stk.	July 26	4⅜	Newc'tle&G'tesh'd Con.	98½–99	..	4 8 5
206,250	,,	June 14	4	Do. 4 p.c. Deb. .	96–98	..	4 1 8	529,705	Stk.	June 28	3½	Do. 3½ p.c. Deb.	84½–85½	..	4 2 1
218,230	Stk.	Aug. 29	11	Brighton & Hove Orig.	210–215	..	5 2 4	55,940	10	Aug. 29	7/7/0	North Middlesex 7 p.c.	13½–14½	..	5 1 4
244,300	,,	,,	8	Do. A Ord. Stk. .	152–155	..	5 3 3	300,000	Stk.	May 15	8	Oriental, Ltd. . . .	134–136	..	5 17 8
531,000	20	Sept. 27	12½	British	44–45	..	5 11 1	60,000	5	Sept. 27	10	Ottoman, Ltd. . . .	8¼–8⅝	..	5 14 3
120,000	Stk.	June 28	4	Do. 4 p.c. Deb. Stk.	91–93	..	4 6 0	60,000	50	Aug. 14	13	Portsea Island B . .	127–130	..	5 0 0
230,000	Stk.	June 28	4	Buenos Ayres 4 p.c. Deb.	93–95	..	4 4 3	100,000	50	,,	12	Do. C . . .	124–127	..	4 14 6
100,000	10	—	—	Cape Town & Dis., Ltd.	2–3	..	—	398,490	5	Oct. 11	8	Primitiva Ord. . . .	6⅞–7*	+⅛	5 14 4
100,000	10	—	—	Do. 4½ p.c. Pref. .	3½–4½	..	—	796,980	5	June 28	5	Do. 5 p.c. Pref. .	5–5½	..	4 15 3
100,000	Stk.	June 28	4½	Do. 4½ p.c. Deb. Stk.	70–73	..	6 3 3	488,900	100	June 1	4	Do. 4 p.c. Deb. .	96–98	..	4 1 8
157,150	Stk.	Aug. 29	5	Chester 5 p.c. Ord. . .	107½–109½	..	4 11 4	312,650	Stk.	June 28	4	River Plate 4 p.c. Deb.	93–95	..	4 4 3
1,513,280	Stk.	Aug. 29	5/9/4	Commercial 4 p.c. Stk.	106–108	..	5 1 2	275,000	5	Apl. 12	12	San Paulo, Ltd. . . .	13–14	..	4 5 9
560,000	,,	,,	5⅛	Do. 3½ p.c. do. .	101–103	..	5 3 6	150,000	10	Sept. 27	6	Do. 6 p.c. Pref. .	11½–12	..	5 0 0
475,000	,,	June 14	3	Do. 3 p.c. Deb. Stk.	73–75	..	4 0 0	125,000	50	July 1	5	Do. 5 p.c. Deb. .	49–51	..	4 18 0
800,000	Stk.	May 31	4	Continental Union, Ltd.	82–85	–1	4 14 2	135,000	Stk.	Aug. 29	10	Sheffield A	229–231	..	4 6 7
200,000	,,	,,	7	Do. 7 p.c. Pref.	133–135	..	5 3 8	209,384	,,	,,	10	Do. B	229–231	..	4 6 7
492,270	Stk.	—	6⅜	Derby Con. Stk. . . .	124–125	..	4 12 0	523,500	,,	,,	10	Do. C	229–231	..	4 6 7
55,000	,,	—	4	Do. Deb. Stk. . .	103–105	..	3 16 2	90,000	10	Sept. 27	7½	South African . . .	9–10	..	7 10 0
1,092,180	10	July 26	10	European, Ltd. . . .	19–20	..	5 0 0	6,429,895	Stk.	Aug. 29	5/9/4	South Met., 4 p.c. Ord.	116–118	..	4 12 8
16,160,600	Stk.	Aug. 14	4/17/4	Gas-) 4 p.c. Ord. . .	102–104	–1	4 13 2	1,895,445	,,	July 12	3	Do. 3 p.c. Deb.	76–79	..	3 15 11
2,600,000	,,	,,	3½	light) 3½ p.c. max. .	81–84	..	4 3 4	209,820	Stk.	Aug. 14	8½	South Shields Con. Stk.	162–164	..	5 3 8
4,062,235	,,	,,	4	and) 4 p.c. Con. Pref.	99½–101½	..	3 18 10	605,000	Stk.	Aug. 14	5/16/8	S'th Suburb'n Ord. 5 p.c.	119–121	..	4 16 3
4,531,705	,,	June 14	3	Coke) 3 p.c. Con. Deb.	76–78	..	3 16 11	60,000	,,	,,	5	Do. 5 p.c. Pref. .	118–120	+2	4 3 4
258,740	Stk.	Sept. 19	5	Hastings & St. L. 3½ p.c.	91–93	..	5 7 6	117,058	,,	July 12	5	Do. 5 p.c. Deb. Stk.	120–122	..	4 2 0
82,500	,,	,,	6½	Do. do. 5 p.c.	—	..	—	502,310	Stk.	May 15	5	Southampton Ord. . .	105–107	..	4 13 6
70,000	10	Oct. 11	11	Hongkong & China, Ltd.	16–16½*	..	6 13 4	120,000	Stk.	Aug. 14	7½	Tottenham) A 5 p.c. .	142–145	..	5 0 0
131,000	Stk.	Sept. 13	7⅜	Ilford A and C . . .	154–157	..	4 17 1	483,940	,,	,,	5⅜	and) B 3½ p.c. .	114–116	..	4 19 2
65,780	,,	,,	6⅛	Do. B	121–123	..	4 19 7	149,470	,,	June 28	4	Edmonton) 4 p.c. Deb.	94–96	..	4 3 4
65,500	,,	June 28	4	Do. 4 p.c. Deb. . . .	91–93	..	4 6 0	182,380	10	June 15	5	Tuscan, Ltd.	8⅜–8⅝	..	5 15 11
4,940,060	Stk.	May 15	9	Imperial Continental .	180–185	–1	4 17 3	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	97–99	..	5 1 0
1,235,000	Stk.	Aug. 14	3½	Do. 3½ p.c. Deb. Red.	86–88	..	3 19 7	236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	114½–115½	+⅛	4 6 7
200,242	Stk.	Aug. 29	6	Lea Bridge Ord. 5 p.c. .	122–125	..	4 16 0	255,636	Stk.	Aug. 29	6⅞	Wands-) B 3½ p.c. . .	138–141	..	4 17 6
								85,766	,,	June 28	3	worth) 3 p.c. Deb. Stk.	70–72	..	4 3 4

Prices Marked * are "Ex. Div."

Additional Water-Works for London.—At the meeting of the Metropolitan Water Board last Friday—the first after the summer recess—it was decided, on the recommendation of the Works and Stores Committee, to provide new works in the Kent district at a total estimated cost of £89,395, including a new well and pumping machinery at Shortlands to cost £30,000, pumping machinery at West Wickham, and a new main between Addington Road and Lock's Bottom. Additional works are to be carried out in other parts of London.

Limerick Gas Undertaking.—Some time ago, the Limerick Borough Council appointed a Special Committee to investigate and report as to the working of the gas undertaking. The Committee have now had before them reports from gas workers and also from other towns on the quantities of coal used and the prices paid, as well as returns as to fuel deliveries on foot of contracts. An inquiry has been commenced regarding the performance of a contract for a large quantity of coal entered into by the Gas Committee in the year 1906. The records showed that only a portion of the bulk contracted for had been taken from the contractor in the time specified, which necessitated the Committee subsequently purchasing coal at greatly enhanced prices.

Clitheroe Corporation Gas Finances.—At last Thursday's meeting of the Clitheroe Town Council, the members were supplied with copies of the abstract of accounts for the past financial year, compiled by the Borough Treasurer (Mr. J. H. Taylor). It is recorded that the gas undertaking continues a most profitable concern; the gross surplus on the last twelve months working being £4785—an increase of £800. Notwithstanding a strong opinion that part of the profit should be applied to the relief of the rates, it has been decided to carry the whole of the money to the depreciation fund, which now stands at upwards of £5000. The capitalization of annuities has resulted in the value of the works being increased by £20,882. The proceeds from the sale of gas last year amounted to £8410; the public lighting cost £660.

Barnet Public Lighting.—At the last meeting of the East Barnet Valley Urban District Council, the Sub-Committee appointed to consider the matter of the lighting of the roads drew attention to the continued inefficiency of large numbers of the lamps, and recommended that the Gas Company should be asked to fit up some of them with improved burners—say, twin-light inverted burners, of the type used at Southgate—for inspection by the Council. A letter had been received from the Manager of the Company to the effect that the lighting did not merit the general condemnation expressed in a letter which had been sent to them. He stated that the lamps were too far apart and badly placed. He was, however, having all the burners attended to. Mr. Ford said it was not out of any ill-feeling to the Company that the Sub-Committee made their recommendation. It was suggested that the Company should themselves try the improved method of lighting in use at Southgate, so that when the Electricity Company came along the public would be in a better position to judge whether gas or electricity gave the better light. The recommendation was approved.

Messrs. R. & A. Main, Limited, of Edmonton, forward copies of their new season's gas-fire and radiator lists, which contain illustrated particulars of the well-known "St. Nicholas" gas-fire, the "D.S.O." (season 1912-13) series of fires, and the several patterns of gas-heated radiators made by the firm.

Among new joint-stock companies recently registered are: Oldbury S. C. Syndicate, Limited, Manufacturers of Cyanides, with a capital of £10,034, in 10,000 ordinary and 34 preferred shares. Robinlyte Amalgamated Companies, Limited, with a capital of £30,000, in £1 shares ("A," "B," and "C," in equal numbers), to acquire the undertakings of Robinlyte, Limited, and Robinlyte (Foreign Patents), Limited, and any patents, concessions, and the like; and to carry on the business of manufacturers of, and dealers in, incandescent mantles and gas burners, &c. Fallot Incandescent Light Company, Limited, with a capital of £5000, in £1 shares, to acquire, deal with, and turn to account certain inventions or processes relating to the use of gas or electricity, separately or in combination, for lighting, heating, or otherwise, and to adopt an agreement with W. S. Searle and L. Girodo.

An article appears in the "Aldershot News" drawing attention to the advantages of gas for home use—lighting, cooking, and heating being dealt with first, and then the question of hot water supply. The concluding sentences are as follows: "With gas at the price at which it is sold in Aldershot, varying from 2s. 6d. in the town to 4s. in more remote parts of the district, with a rebate of 6d. per 1000 cubic feet on gas used for cooking and heating purposes, the economy of its use is apparent. Perhaps nothing serves to demonstrate better the utility of gas for domestic and business purposes than the experience of those who, during the coal strike, were able to continue its service without any rise in the cost, and were able to dispense with the use of coal at a time when it was so costly. It is obvious that gas is still making progress; but it stands to-day in the highest rank among other commodities for lighting, heating, cooking, and motive power."

It will doubtless be remembered that some time ago Alderman J. B. Mulholland, who represented Hammersmith on the Metropolitan Water Board, raised the question of the treatment of consumers who had made overpayments in mistake. As he failed to move the Board, a conference of the constituent authorities was held in the Westminster City Hall, at which resolutions strongly condemnatory of the Board's practices were unanimously carried. As no change resulted, an independent inquiry was subsequently requested by the Hammersmith Borough Council; but this was refused by the Board. In these circumstances, Alderman Mulholland has resigned his membership. In his letter to the Clerk, he states that in this action he is "influenced to a considerable extent by the action of your Appeal and Assessment Committee in refusing to reasonably refund overpayments made by consumers in mistake;" and he adds that he regards these methods as not only unfair, but dishonest.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

EXPERT IN GAS-FIRE CONSTRUCTION. No. 5640.
TECHNICAL CHEMIST. No. 5641.
DRAUGHTSMAN. Drakes Limited, Halifax.
DRAUGHTSMAN. R. & J. Dempster, Limited, Manchester.
WORKING MANAGER. No. 5642.
FITTINGS INSPECTOR. Sheffield Water Department.
GAS FITTERS. Birmingham Gas Department.
GAS FITTER. Sheerness Gas-Works.
MAIN AND SERVICE LAYER. No. 5643.
CHARGE OF SHOWROOM. Newport (I. of W.) Gas-Works.
DISTRICT CANVASSER. Reading Gas Company.
CLERK. Leatherhead Gas and Water Company.
GENERAL FOREMAN. Broughty Ferry Gas-Works.

Appointments, &c., Wanted.

TRAVELLER (North of England). No. 5644.

Agency Wanted.

DARNEY AND CO., 56, Great Queen Street, W.C.

Meeting.

CEARA GAS COMPANY. 9, Queen Street Place, E.C. Oct. 25. One o'clock.

Plant, &c. (Second-Hand), for Sale.

LAMP COLUMNS AND LANTERNS. Barnsley Gas Company.

Licensees Wanted.

"ST. MUNGO" GAS-FIRE. Mr. P. Fyfe, 23, Montrose Street, Glasgow.

Stocks and Shares.

BOGNOR GASLIGHT AND COKE COMPANY. By Auction. London Mart. Nov. 12.
GRAVESEND AND MILTON GAS COMPANY. By Auction. London Mart. Nov. 12.
GRAYS AND TILBURY GAS COMPANY. By Auction. London Mart. Nov. 5.
HYTHE AND SANDGATE GAS COMPANY (Alteration of Date). By Auction. London Mart. Nov. 26.
SEVENOAKS WATER-WORKS COMPANY. By Tender. Oct. 26.
SOUTH ESSEX WATER COMPANY. By Auction. London Mart. Nov. 5.

TENDERS FOR

Fire-Clay Goods.

SHEFFIELD GAS COMPANY. Tenders by Nov. 5.

Incandescent Mantles, Rods, &c.

CALCUTTA CORPORATION (Amended advertisement Tenders by Nov. 20.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

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[*See Article in* "JOURNAL" *for Oct.* 1, *p.* 20.]

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